MAR 20 1944

The Welding Engineer

MARCH, 1944

4th ANNUAL DIRECTORY AND STATISTICAL ISSUE

Jackson's QUIK-TRIK CABLE CONNECTOR

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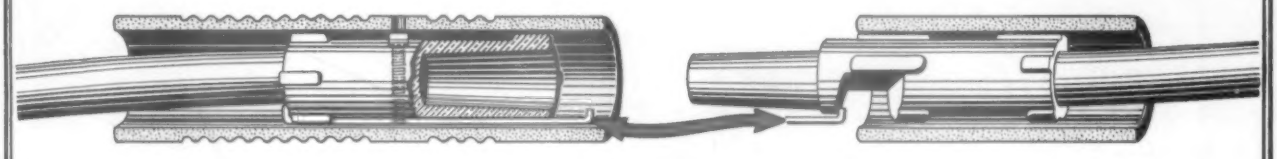
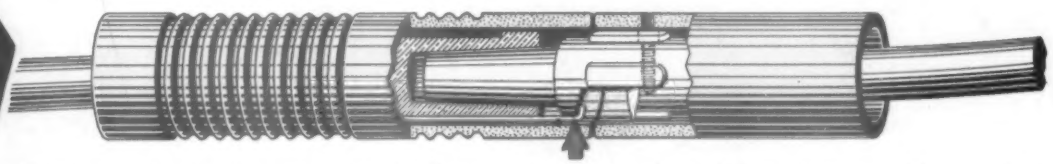
—fully insulated . . . SAFE



Female Section is soldered to cable lead Male Section is soldered to cable extension
Removable insulators are securely held in protective position with Allen screws.

HOW IT WORKS..



Connection is made by inserting Male Section into Female Section. Then, with a twist, the locking spring rides the cam into position holding both sections tight.
To unlock, simply twist apart.

PATENT APPLIED FOR

Important: Female Section, installed on cable lead, as shown above, may also be used as a handle and connected directly to the "Stinger" end of a Jackson Model TA holder as shown below. The adaptation saves time and material, eliminates the danger of live cable ends and makes possible the economies of standardization.

Contact your nearest Jackson dealer or write for Bulletins D and D-CC.

(above) Typical cable extension assembly for users of Jackson Model TA holders.

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The Sawyer Blower in the foreground is a product of an A. O. Smith subsidiary.

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The Welding Engineer

AMERICA'S PIONEER WELDING JOURNAL

Established 1916

Or Else . . .

The picnic is about over.

For the past several years welding equipment manufacturers, distributors and jobbers have been enjoying a profitable sellers' market. It was nice to discover that "the customer wasn't always right," but that particular discovery is a dangerous one to make right now.

If you are still telling the customer either to "Go to the devil" or take what you have to offer, you had better change tactics. "Or else" is fast going out of date as a business slogan.

Some believe the picnic will last as long as the war, but the best indications are that the customer will be right again long before the war ends. Think back over the past year of selling! Remember how difficult it was to get welding supplies a year ago. It is a lot easier now—well, isn't it? Shipments which then were back-ordered are now made from stock. It looks very much as though the time is not too far distant when welding manufacturers and jobbers will have to operate in a critical buyers' market.

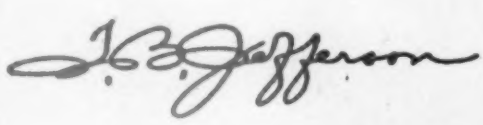
Last year more than $360,000,000 were spent for welding materials and equipment to produce products valued at over $100,000,000,000. On the basis of past growth, indications are that if it were not for the war last year's business would have been around $210,000,000—58% of the actual total. Most of us realize that business is inflated, and most of us would be satisfied after the war with 58% of the business we are now doing.

Are you making plans to retain 58% of your present business? Not to capture it—just to retain that much of what you now have.

The manufacturer who has fired (or forgotten) his distributor certainly has not made such plans. Neither has the jobber who has fired all of his salesmen. For salesmen and distributors will be vitally needed when you can no longer sit back and get more orders than you can handle over the telephone.

The war may last a long time, but not even the most pronounced pessimist feels that it will last forever. When peace comes—this year, next year or the year after—it will be more satisfying and surely much more profitable to serve old friends than to try to find new ones. It is going to be exceedingly difficult to win back all the little fellows you forgot in the rush for big business because *they* will not forget that *you* forgot. On the other hand, they will gratefully remember the efforts that you made to serve them during difficult times. Which is it going to be?

When peace returns, there will be business enough for everyone who is entitled to it. What you are doing right now—your attitude toward present and potential customers—will determine whether or not you *are* entitled to it . . . and how large your own particular share is going to be.



It has always been the policy of the Metal & Thermit Corporation to pay special attention to the development of electrodes for welding special steels. Murex Carbon Moly. 50, Molex and Type M, for example, are outstanding in their performance for welding carbon-molybdenum steel plate, castings, high pressure, high temperature piping and pressure vessels. Murex R.C. and C.F., for the repair and welding of air-hardening steel castings are among the electrodes developed to meet the needs of war production.

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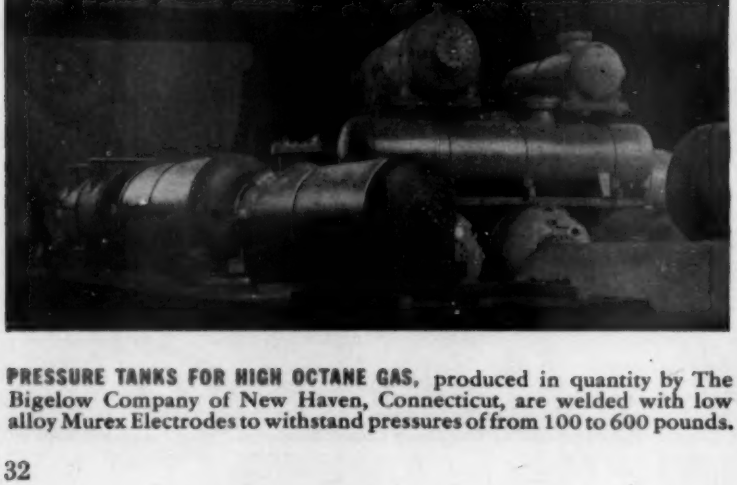
PROVIDING HEAT AND FRESH AIR FOR OUR COMBAT VESSELS. these heating units, produced by McQuay, Inc. of Minneapolis, must be rugged to withstand gunfire shock and near miss bomb concussion. To combine sturdy construction with light weight, welded construction using Murex Electrodes was adopted for the heater casings.

HUGE TURBINES FABRICATED WITH MUREX ELECTRODES by S. Morgan Smith Company, world's largest exclusive turbine builder. The illustration shows welding of a three-way branch inlet of a Vertical Impulse Turbine. Advantages of arc welding are: elimination of possible defects of complicated castings; less metal used; figuring of exact weights possible, thus enabling manufacturer to keep within estimates. Down-hand Murex Electrodes are used.

THIS 7½-TON STEEL CYLINDER on an 800-ton hydraulic press developed a crack 20 inches long and after preparation for welding 3 inches wide, and from 4½ to 6½ inches deep. Preheated 9 hours at about 700° F., this temperature was maintained during 17 hours of continuous welding with Murex Type F ¼ inch rods. The Detroit & Cincinnati Welding Company report that cylinder wall distortion was only about .0015" and that the flange moved only .004".



PRESSURE TANKS FOR HIGH OCTANE GAS, produced in quantity by The Bigelow Company of New Haven, Connecticut, are welded with low alloy Murex Electrodes to withstand pressures of from 100 to 600 pounds.

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Two-Tone Welding

The prevailing scarcity of both labor and new parts for tractors and power shovels has demanded faster methods of rebuilding worn parts. The newly developed "two-tone" process—used with and without applicator bars—makes it possible to speed welding by as much as 200 to 300%.

By J. A. CUNNINGHAM
Welding Application Engineer,
Arcway Equipment Co., Philadelphia

Fig. 1—Two-tone welding procedure. Using an E-6010 reverse-polarity electrode, the operator holds one end of a ⅜ in. cast iron filler rod adjacent to the arc.

VERY few people realize that crawler-type tractors have two sets of tracks, each with a double set of rails. On the larger sizes, the track rails are approximately 2⅛ in. wide and 24 ft long, thus presenting an area of 17 sq ft of tracks that must be rebuilt when worn. The area of the twelve double-faced rollers, which measure 8¾ in. in diam and 2¼ in. across the face, adds another 10.3 sq ft to the total job. In addition, the sides of the track rails and the flanges of the rollers must be rebuilt as well as the two front idlers.

Ordinarily welding methods require from 70 to 100 hours to repair the total area of 41 sq ft (which includes all flanges and edges of track rails but does not include driving sprockets) if the parts are worn as little as ⅛ to 3/16 in. Thus it is easy to appreciate the advantages of the new "two-tone" welding process.

Even when bottom rollers, front idlers and track rails have been worn 3/16 to ⅜ in. and the edges and flanges are severely worn, the rebuilding time is kept within 48 hr limits by this rebuilding process. In some cases, the time is still further reduced by two-tone welding and the use of applicator bars.

Two-Tone Technique

The new hard-facing technique consists of conventional metal-arc welding coupled with the use of a filler rod. A ¼ in. E-6010 (mild steel, d-c reverse-polarity) electrode is used in the electrode holder while the operator holds one end of a ⅜ in. (cast iron or alloy steel) hard-facing filler rod adjacent to the arc as shown in Fig. 1. Equal quantities of the electrode and filler rod are consumed.

Thirty per cent more amperage than is normally used on the E-6010 electrode is required for two-tone welding, the excess amperage being employed to melt down the auxiliary filler rod, which is moved along in unison with the overcharged electrode. Since welding progresses from two to three times more rapidly than usual, the parent metal is not subjected to abnormal heating or warping. The electrode coating mixes with the combined electrode-and-filler-rod metal and rises to the top in the usual manner.

The Combined Deposit

The electrode and the filler rod mix together thoroughly, giving a combined deposit of high-carbon, low-alloy steel which resembles low-alloy tool steel in grain structure, hardness, toughness, and wear resistance. Deposits produced by using a moly-nickel cast iron hard-facing rod have a hardness of 425 to 525 Brinell, depending upon the rate of cooling. Such deposits will not shatter or spall off, nor will they check when welded in a wide weave (obviously, stringer beads chill rapidly and hence produce a harder deposit).

Two-tone welding is extremely fast. Two to three times more metal can be applied per hour than by ordinary methods. Even on narrow sections and on comparatively thin stock, it is very easy to control the deposit, for the reason that the weldor can feed in more auxiliary rod at will in order to chill the molten metal.

The filler rod, which carries no current whatsoever, is held in front of the arc in the direction of travel.* The electrode is tilted backward from the direction of travel instead of forward, thus permitting a small portion of the arc to bite into the ever-present filler rod and melt it down. The best results are obtained by holding an average-length arc (28 to 32 volts). The arc is started by welding without the filler rod for approximately two seconds in order to produce the molten pool into which the filler rod is fed.

*When backing up a filler bar (a weld similar to a fillet weld), the electrode should lead the filler rod to obtain maximum penetration.

Rod and Electrode Sizes

While ¼ in. filler rod (moly-nickel cast iron) is satisfactory, ⅜ in. is preferred since it consumes less rapidly and, therefore, permits its tip to be maintained at a higher temperature. Smaller filler rods burn off so rapidly that the rod is still cold as it approaches the arc and "sticking" may result. Furthermore, the butt ends of smaller filler rods must be more frequently welded to new filler rods. Larger rods than ⅜ in. are satisfactory but require more amperage for melting and are more difficult to manipulate.

One-quarter or 5/16 in. electrodes are used in the holder. Smaller electrodes—7/32 in. or 3/16 in.—may be used when the welding machine is not capable of producing enough amperage for ¼ in. electrodes. E-6010 or E-7010 reverse-polarity electrodes are generally recommended. With these heavily coated, all-position d-c electrodes, the flux is less troublesome because it has less tendency to accumulate in front of the arc. Furthermore, the operator can produce a thicker deposit because the metal freezes faster. This fact also allows the operator to weld near an edge or on a curved surface.

Welders—D-C and A-C

A standard NEMA rated 200 amp

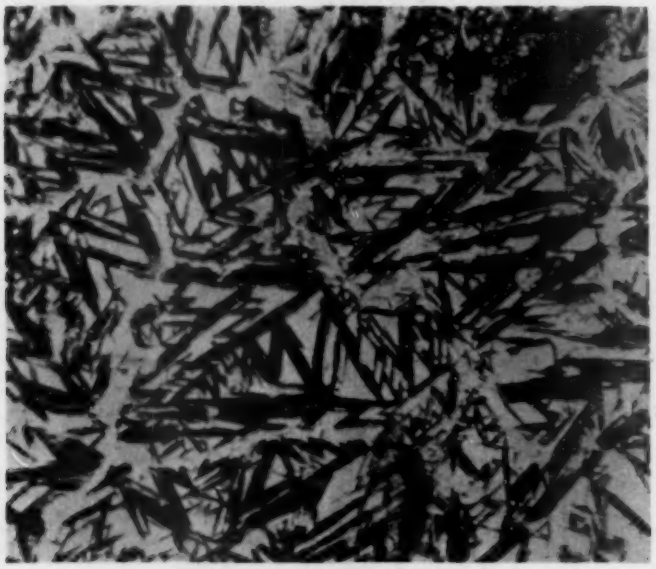


Fig. 2—Photomicrograph of a two-tone weld made with 1/4 in. E-6010 electrode and a 3/8 in. moly-nickel cast iron filler rod.

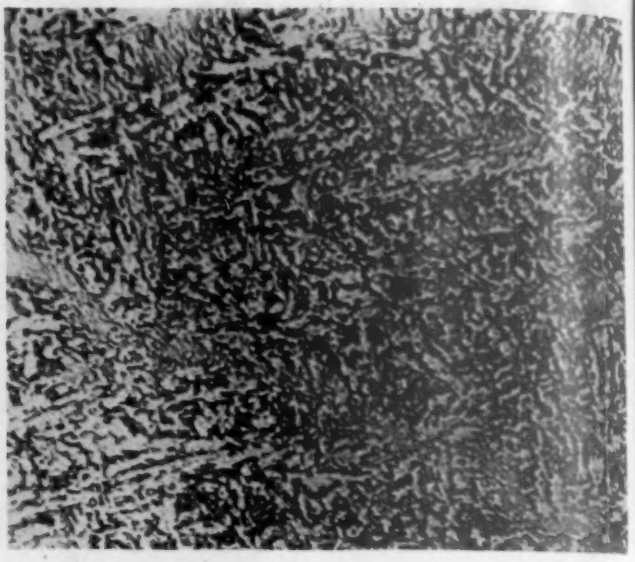


Fig. 3—Photomicrograph of a two-tone weld made with a 1/4 in. E-6010 electrode and a 3/8 in. high carbon alloy steel filler rod.

d-c welder with short cable leads has enough capacity to weld with 1/4 in. E-6010 electrodes. Though this capacity welder is satisfactory for repairing tractor parts, a 300 amp set is to be preferred for speed advantage, especially for work on power shovel parts.

An a-c transformer-type welder can be used in the two-tone process with E-6030 or E-6020 electrodes (commonly called "hot rods") if the work is flat or positioned 5 to 10 deg upward. However, experience has demonstrated that a d-c arc welder with an E-6010 electrode is generally preferable.

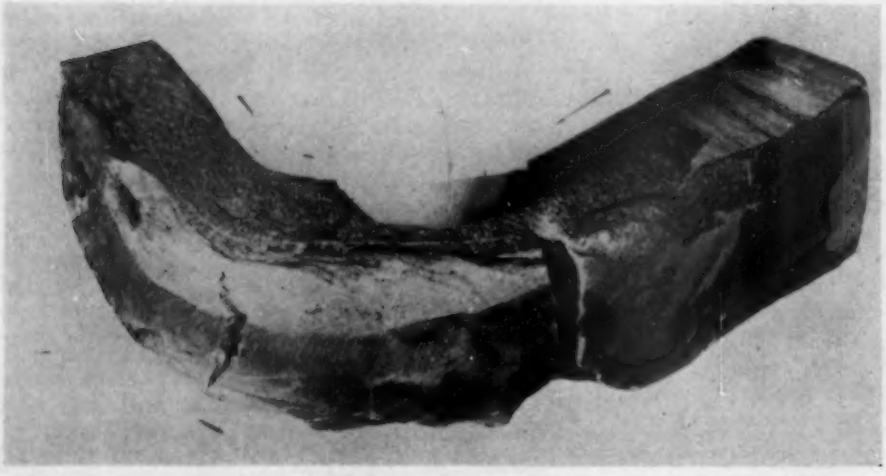
Straight polarity, all position electrodes can be used with either a-c or d-c welders, but, in general, E-6012 (d-c straight polarity or a-c) electrodes are not recommended because the arc is not sufficiently penetrating to bite into and mix thoroughly with the filler rod. Furthermore, E-6012 electrodes will not penetrate as easily through rust, dirt, etc.

Properties of Deposits

Fig. 2 is a photomicrograph of a two-tone weld made with a 1/4 in. E-6010 electrode and a 3/8 in. moly-nickel cast iron filler rod. Note that the weld metal has a fine martensitic grain structure. These weld deposits will withstand moderate shock, edge impact and severe abrasion. Their only disadvantage is that they are not machinable.

Fig. 3 is a photomicrograph of a two-tone weld made with an E-6010 electrode and a 3/8 in. high-carbon alloy steel filler rod. In Fig. 4, a weld on a 1/2 in. plate made with the same combination of electrode and filler rod has been subjected to bending. The weld bent 35 deg before cracking. The tensile strength of the deposit is estimated to be 150,000 psi and the ductility 5 to 10%.

Fig. 4—Effects of bending a weld made in 1/2 in. plate with an E-6010 electrode and a high-carbon alloy steel filler rod. A 35 deg bend was required to crack this weld.



The high-carbon alloy steel filler rod is used on high-carbon or excessively worn tractor rails to assure proper strength and resistance to cracking. It can also be used on many other applications, such as worn wobblers and coupling boxes in steel mills, building up crane wheels, rail ends, etc. Deposits made by using this type of filler rod are machinable with tungsten carbide cutting tools, though grinding is in general more satisfactory. If machining is essential on jobs requiring 1/2 in. or more of build-up, it is suggested that a mild steel filler rod be used for the last two layers of two-tone welding.

Hard-Facing over Two-Tone

When parts are to be subjected to extreme wear, a 1/8 to 5/32 in. layer of harder and more wear-resistant metal can be applied over the two-tone deposits with a regular hard-facing electrode. An example is provided by tractor bottom rollers, which wear out before the rails simply because the rollers have less wearing surface. Hence it is advisable to hard-face over the rollers, using a moly-nickel cast iron electrode without any filler rod. This also helps to obtain a smoother deposit. The moly-nickel hard-facing electrode, however, should not be used alone on small or excessively worn track rails because it checks and thus invites cracking. Furthermore, the moly-nickel cast iron when applied as an electrode on rails has a tendency to chip at the outside edges due to the extreme edge impact encountered. On rollers, the wearing face is not subjected to edge impact.

Fig. 5 shows how the two-tone process is used to rebuild worn track rails. If the rails are part of smaller

size tractors (or if any of the links have previously broken in service), it is not advisable to attempt welding. For excessively worn large tractor rails, the high-carbon alloy steel filler rod should be used rather than the moly-nickel cast iron. The same filler rod may be used on high-carbon-steel rails that have worn not more than $\frac{3}{16}$ in. Welding should not be attempted, however, on excessively worn high-carbon-steel rails.

An a-c (or reverse-polarity d-c) hard-facing electrode should be used after an application of two-tone (with moly-nickel cast iron) for excessively worn bottom roller and idler flanges. These flanges should not be finished with the moly-nickel-iron electrode alone or with any hard-facing electrode which is either rough and hard or subject to spalling. The reason is that a wiping action is encountered between the sides of the track and roller flanges. Obviously, a rough or extremely hard deposit on the roller flanges would produce a filing action and tend to cut the sides of the rails.

Many other uses for the two-tone process can be found in the maintenance of steel mills, cement mills, quarry machinery, etc. By using various grades of filler rods, many of the higher-priced hard-facing deposits can be duplicated. In industries such as cement manufacturing where large areas must be rebuilt, a plain cast iron filler rod may be used for economical reasons. In these cases, the deposit will be 50 to 100 Brinell points softer (depending upon the rate of cooling) than when a moly-nickel cast iron rod is used as the auxiliary filler rod. Machinable deposits can be acquired by welding with an E-6010 electrode and applying an 0.70% carbon steel auxiliary filler rod.

Applicator or Filler Bars

The proper application of mild steel bars in conjunction with the two-tone process can greatly reduce welding time in rebuilding worn parts on tractors and shovels. Concrete reinforcing rods or any type of round mild steel bars or nickel-manganese bars are satisfactory for this application.

Frequently, the face of a bottom roller on a crawler tractor becomes dislodged from the rails of the track and one edge may be completely broken or worn away. This occurs because of misalignment of the track through improper adjustment of the front idlers to compensate for wear or because of bent side arm castings, etc. To repair, a $\frac{3}{8}$ or $\frac{1}{2}$ in. round mild steel bar is welded flush with the roller face around the entire circumference, bending after each one to two

Fig. 5—Using the two-tone process to rebuild worn track rails.

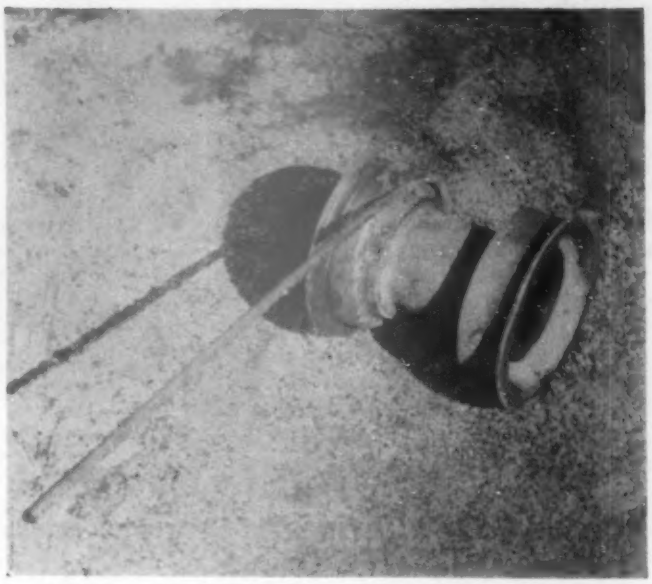


Fig. 6—Use of an applicator bar in the repair of a crawler tractor bottom roller. The bar was welded flush with the roller face around the entire circumference.

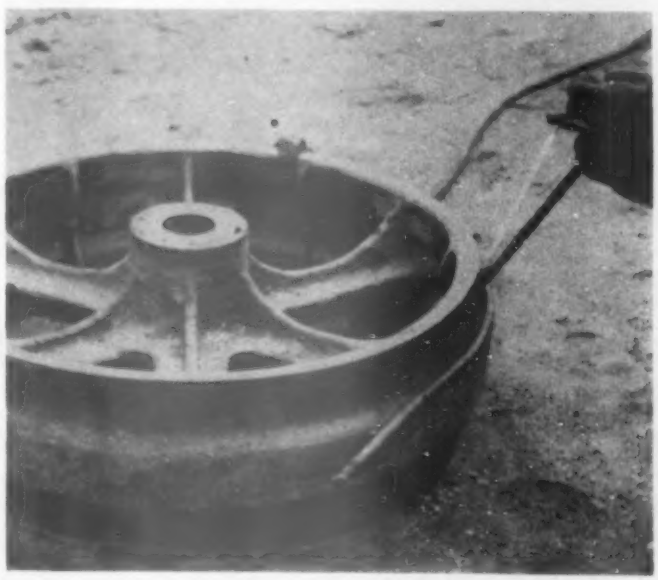


Fig. 7—Repairing a worn tractor idler. Filler bars were first welded at the sides of the flange, and two-tone welding was then used to fill in behind them.

inches of weld (Fig. 6). Hard-facing is then applied over the entire face with two-tone as the initial deposit and moly-nickel cast iron applied alone as a final deposit. (If only one layer is required, the two-tone should be omitted and the moly-nickel cast iron applied alone.) The roller can then be turned on end and two-tone welding used to fill in behind the applicator bar.

Idlers and Drive Sprockets

Fig. 7 illustrates the same procedure for repairing a worn tractor idler. This job was completed in 6 hours, including hard-facing of the face on both sides. First, the wheel was stood in an upright position while a 5/8 in. filler bar was welded on one side of the idler flange, and a 3/8 in. bar on the other, using a 1/4 in. E-6010 electrode. The wheel was then positioned as shown, and one pass of two-tone welding was used to fill in behind the bars. The use of filler bars results in a smoother and more uniform flange surface, which is important to guide the track properly.

It is not uncommon to find that the teeth of tractor driving sprockets have worn very thin or that the ends have worn off entirely. A 3/8 or 1/2 in. round filler bar may be welded on the top of a blunt tooth with a 3/16 in. E-6010 electrode and the entire bar and tooth hard-faced with a 1/4 in. chromium-molybdenum electrode. In a double sprocket, the bar can be left to bridge the teeth as shown in Fig. 8. These bars are subsequently hard-faced in the center, thus adding greater life to both sprocket teeth and bushing. The welding time for two sprockets was only 12 hours, and the cost, including time and materials, was $24. New sprockets would have cost $90 each, so the resultant saving amounted to $156 per pair.

Worn Shovel Roller

Shown in Fig. 9 is a power shovel bottom roller that had been worn down on the periphery and was also galled off along the sides. Since one side was worn more than the other, a 1/2 in. mild steel round bar was welded on that side and a 3/8 in. bar on the other. Two-tone welding with a 1/4 in. E-6010 electrode (300 amp) and a 3/8 in. plain cast iron bar was used to fill in between the bars. One pass was sufficient because the welding was done close to the top of the wheel and gravity forced the molten pool to fill the entire worn section. The applicator bars acted as a dam and prevented the molten metal from flowing over the edges. After the fill-in had been completed, the wheel was positioned on its hub and rim, and the same procedure, the same rods and the same machine settings were employed to make a large single-pass fillet weld that would back up and completely cover the filler bar.

Eight of these rollers were welded in 18 hours at a cost of labor and materials of only $32. New rollers, if they had been available, would have cost $160.

Fig. 8—Filler bars were welded to the top of the teeth and left to bridge the gaps on this double sprocket.

Galled Shovel Track

Fig. 10 shows a power shovel track which was galled along the edges. A 1/2 in. round filler bar was welded along the side with a 1/4 in. E-6010 electrode and the face covered with two-tone welding at 290 amp, using a 5/16 in. E-6010 electrode and a 3/8 in. moly-nickel cast iron filler rod. The tracks were then turned in an upright position and the same process used to back up the filler bar.

An improvised gauge was used in tacking the bars in place to provide the proper width from outside to outside of the filler bars. The entire job of track repair required only 32 hours welding time and cost $50 for welding and $65 for rebushing, including labor and material in both cases. New tracks would have cost $700.

* * *

Photos, courtesy of the General Electric Co.

Fig. 9—Power shovel bottom roller rebuilt by two-tone welding and applicator bars at both sides.

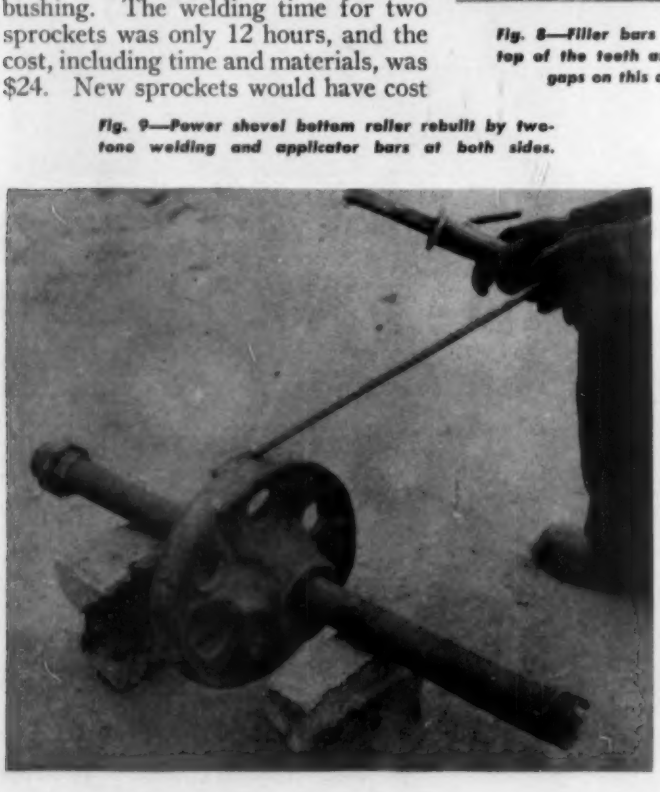
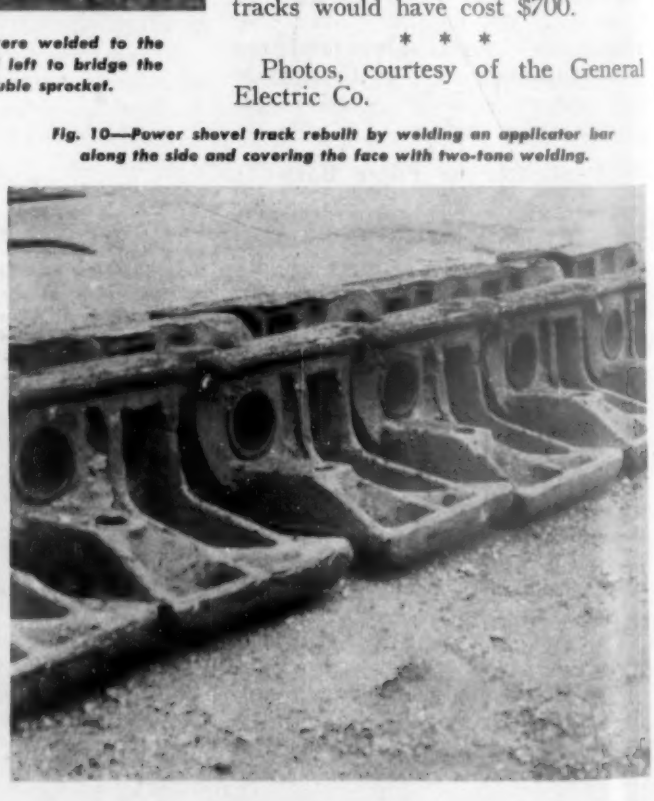


Fig. 10—Power shovel track rebuilt by welding an applicator bar along the side and covering the face with two-tone welding.



FACTS

and figures

A Statistical Review of the Welding Industry

Compiled by **T. B. JEFFERSON**

DESPITE the all-time production peak obtained in 1942, the welding industry was capable of exceeding this figure by 20% in 1943 to establish a new high of over $360,000,000. Gases used for gas-welding and cutting operations represent over 50% of the industry's total or over $185,000,000. Arc-welding electrodes represent about 25% of the industry's total dollar volume.

The sales of gases and arc-welding electrodes are of necessity greater than ever before in order to fill the need for these auxiliary aids for use with welding and cutting machines that were sold in the past as well as in 1943. The increase in the sale of gases has been carefully checked to exclude, as accurately as possible, gas which was used for industrial operations other than welding and cutting. For example, nearly 3,000,000,000 cu ft of acetylene were used in 1943 in the manufacture of synthetic rubber. This huge volume is not included in the total for acetylene presented in this statistical review.

Sales of arc-welding equipment were off somewhat (only in view of past gigantic peaks) since this branch of the industry has caught up with its back log and is in many instances selling from stock. Cutbacks and indecisions regarding war contracts had a definitely adverse effect on arc-welding equipment sales during the latter part of 1943. On the other hand, the demand for arc-welding accessories—weldors' safety clothing and wearing apparel, electrode holders, cables, lenses, etc., was up about 10%.

While more gas welding and cutting equipment was sold during 1943 than in the preceding twelve months, the sales were at a lower price. The result is that there was little relative change in the dollar volume of business in this branch of the industry. The increasing use of flame-cutting and flame-treating processes is indicated by the continual increase in the volume of gases sold and the reflected reduction in the volume of welding wire used.

Resistance welding processes are continuing to gain importance in the industry. Although the volume is still small from a dollar standpoint, it represents a 562% increase since 1939. For the first time, dollar volume of resistance welding electrodes is included in this statistical review of the welding industry.

The demand for welding wire for arc electrodes and gas welding wire is continuing at a phenomenal rate to reach an all-time high of 1,133,876,000 lb as compared to 803,755,822 lb in 1942. This represents a 4699% increase in welding wire production since 1932. During the same period, steel ingot production increased only 666%.

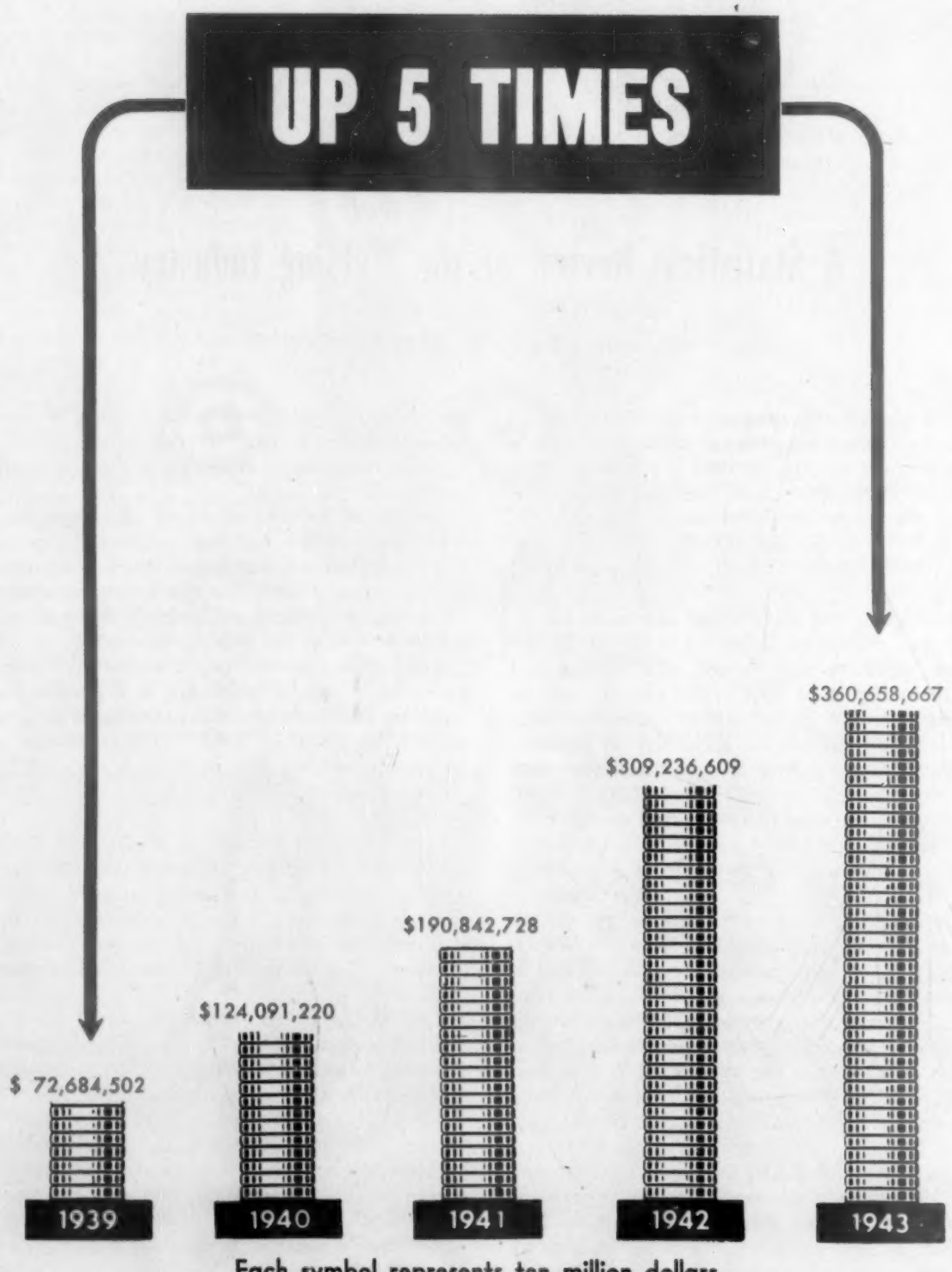
Like previous editions of *Facts and Figures,* the present Fourth Edition indicates that the trend of the welding industry is continuing upward. Even though there is a tendency towards a leveling off because of stabilized war production, we can rest assured that our industry will continue to climb to new and greater heights.

* * *

THE WELDING ENGINEER wishes to thank those individual companies and other organizations without whose assistance it would have been impossible to assemble much of the information presented in Facts and Figures. We are especially indebted to the Bureau of Census, American Iron and Steel Institute, Resistance Welder Manufacturers' Association, Compressed Gas Manufacturers' Association, National Electrical Manufacturers' Association and those in the welding industry whose names must remain secret because of the confidential information disclosed.

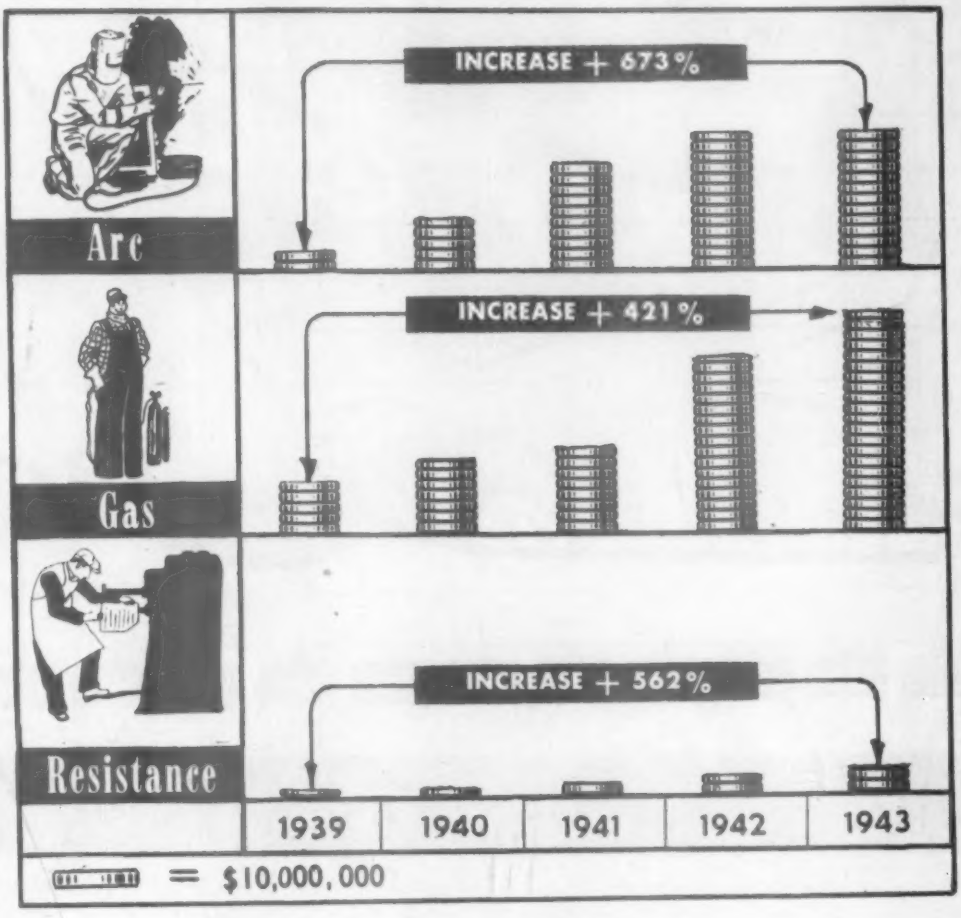
The Welding Industry—

5 years of growth



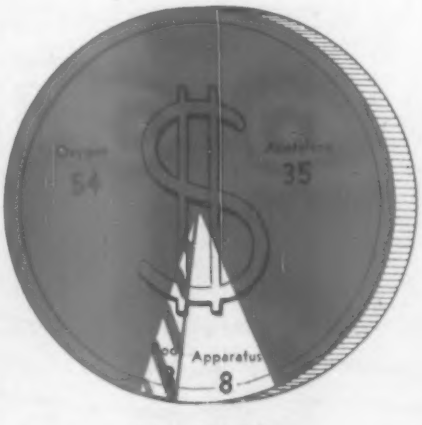
Each symbol represents ten million dollars.

The Dollars in the Welding Industry . . . where they went

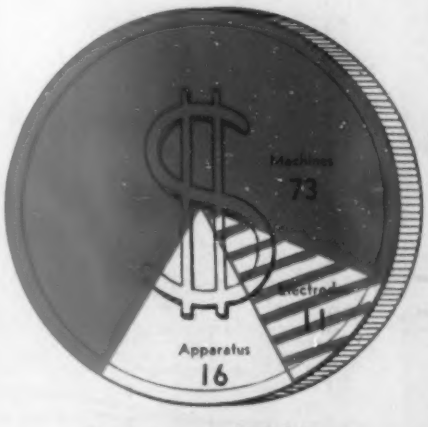


Your Welding Dollar . . . how it was divided

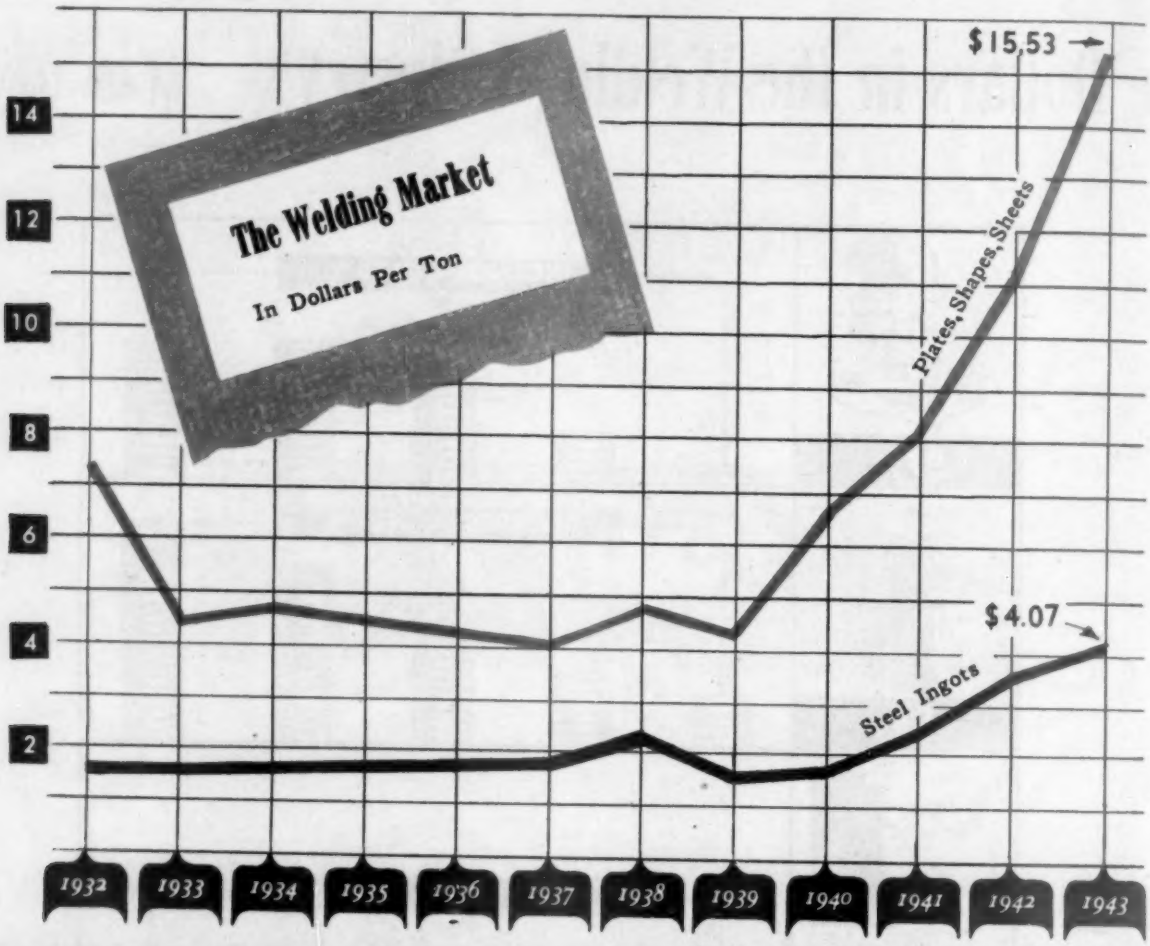
Arc Welding

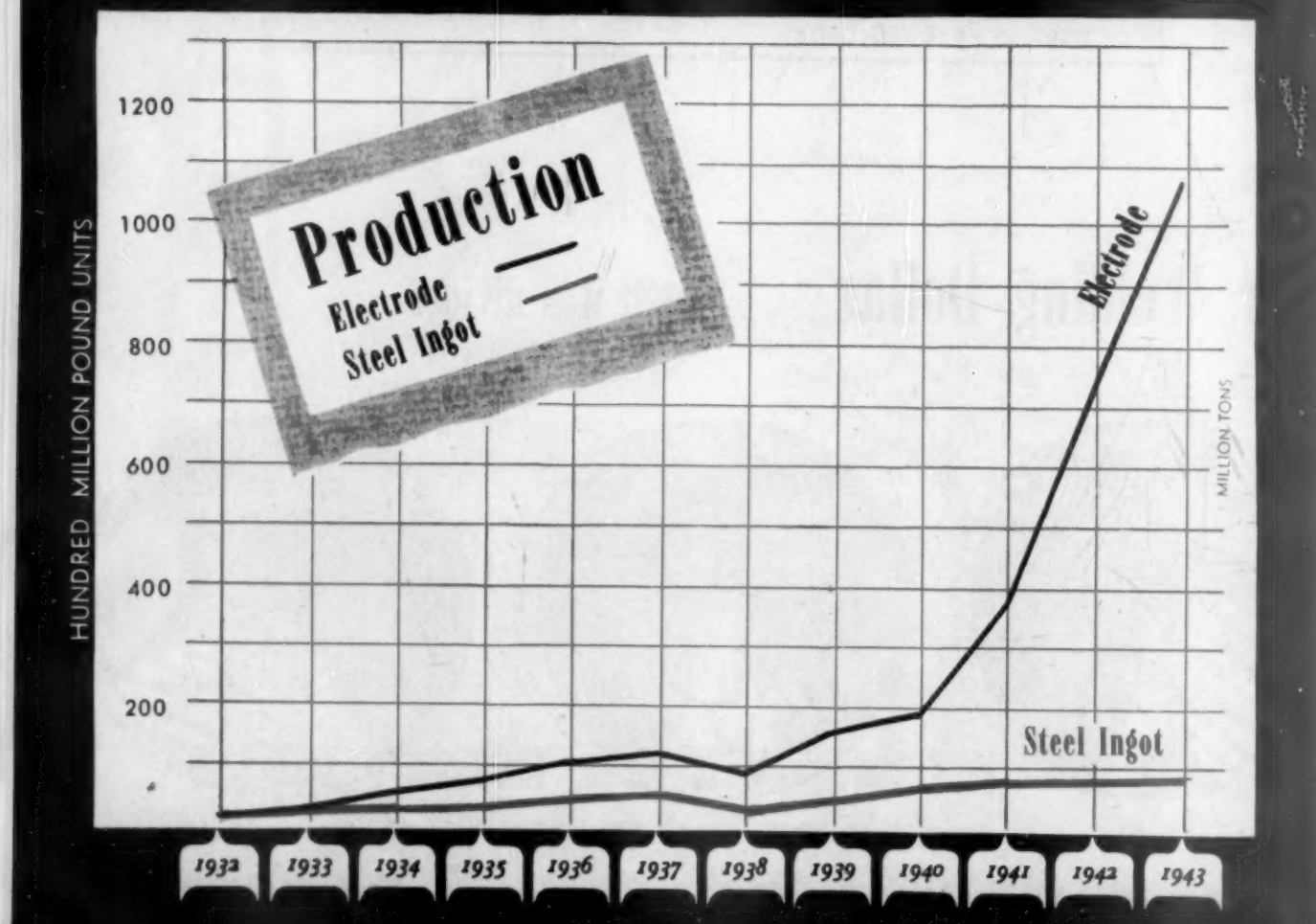


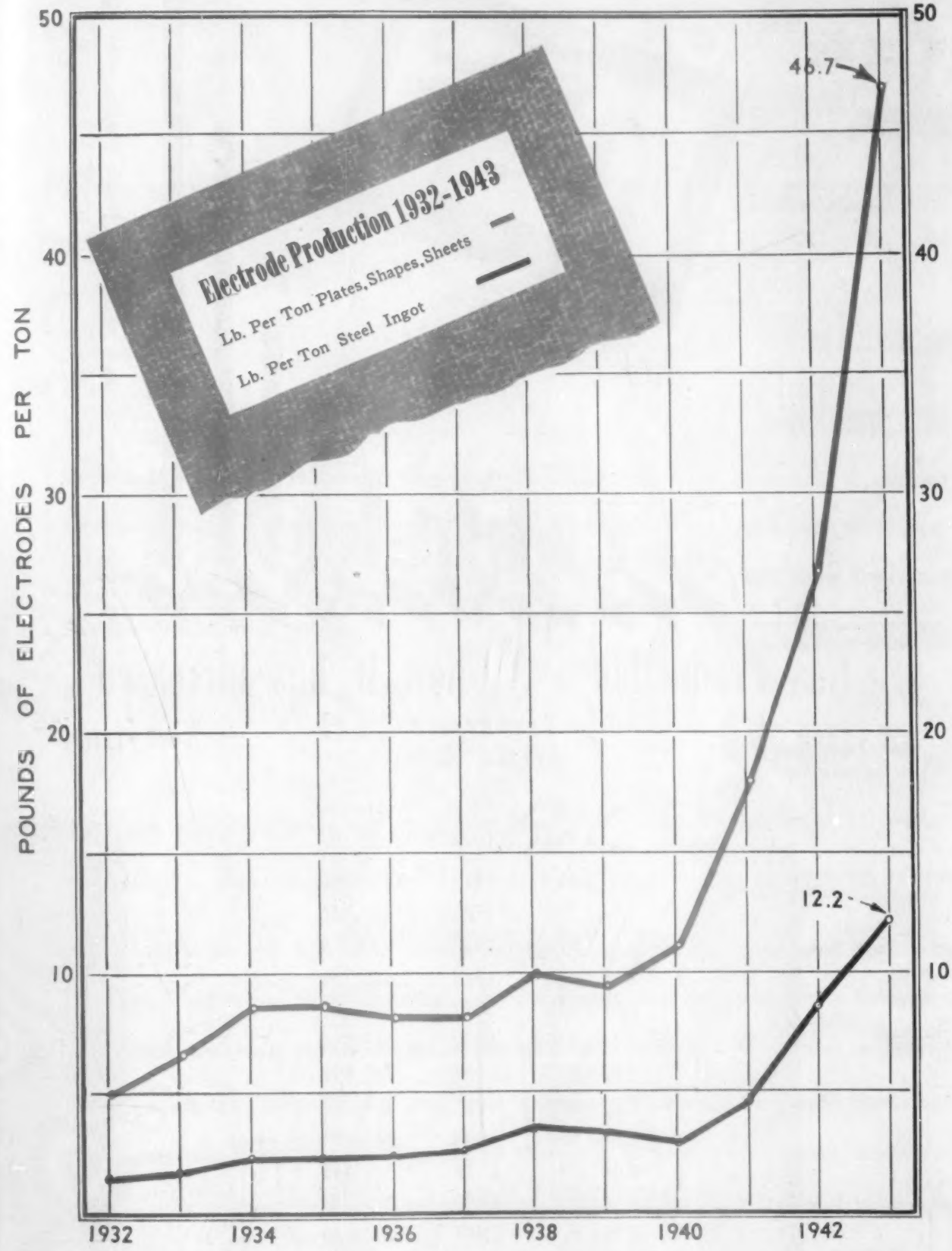
Gas Welding

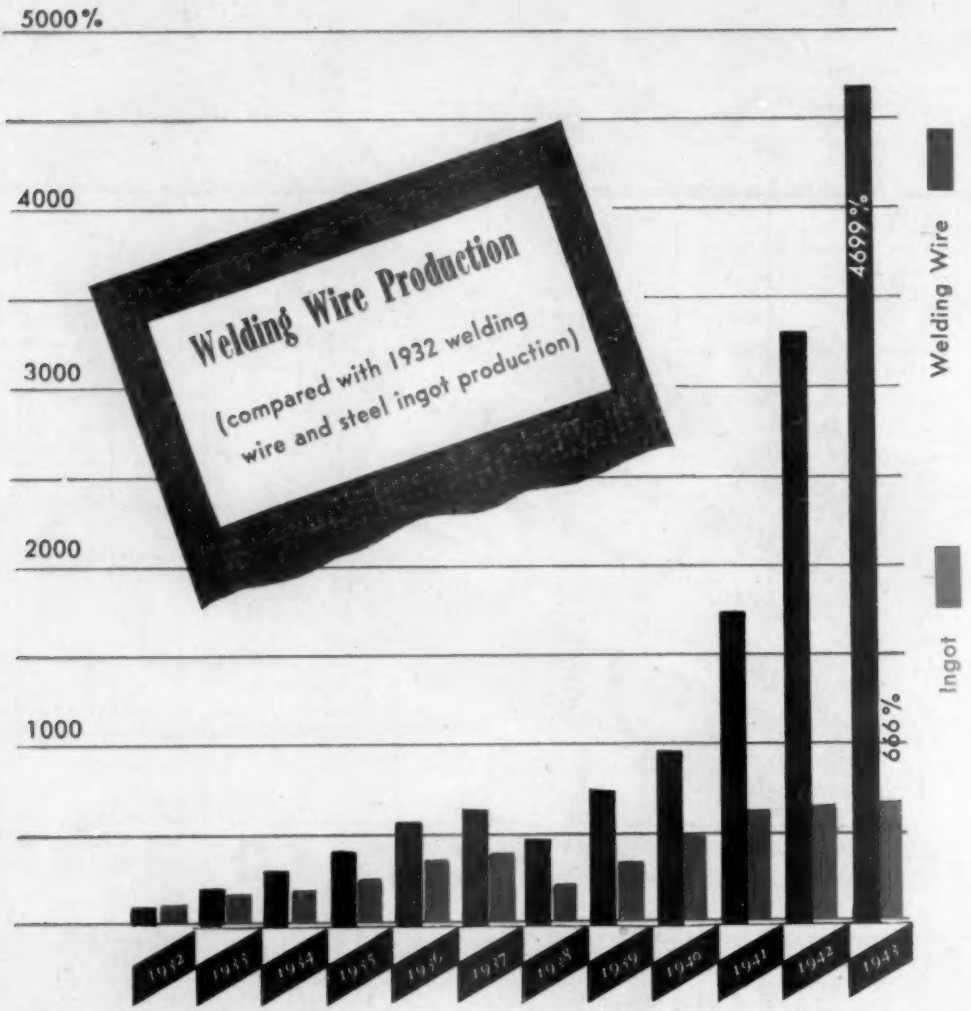


Resistance Welding


The Welding Market
In Dollars Per Ton
$15.53
Plates, Shapes, Sheets
$4.07
Steel Ingots
14
12
10
8
6
4
2
1932
1933
1934
1935
1936
1937
1938
1939
1940
1941
1942
1943


Production
Electrode
Steel Ingot
HUNDRED MILLION POUND UNITS
MILLION TONS
1200
1000
800
600
400
200
Electrode
Steel Ingot
1932
1933
1934
1935
1936
1937
1938
1939
1940
1941
1942
1943


Electrode Production 1932-1943
Lb. Per Ton Plates, Shapes, Sheets
Lb. Per Ton Steel Ingot
POUNDS OF ELECTRODES PER TON
50
40
30
20
10
46.7
12.2
1932
1934
1936
1938
1940
1942



Gas Production . . . how it has increased

Production
(In 1,000 cu. ft.)

Oxygen	Year	Acetylene
104,714	1914	121,696
1,173,414	1919	311,390
1,062,135	1921	291,630
2,057,526	1923	522,349
2,073,826	1925	525,746
2,359,896	1927	682,481
3,140,095	1929	969,534
2,050,377	1931	742,898
1,821,880	1933	754,089
2,683,859	1935	1,143,199
4,441,391	1937	1,511,445
4,561,968	1939	1,274,164
7,181,479	1941	2,030,520
14,987,643	1942	4,199,863
20,483,830	1943	5,603,897

Oxygen

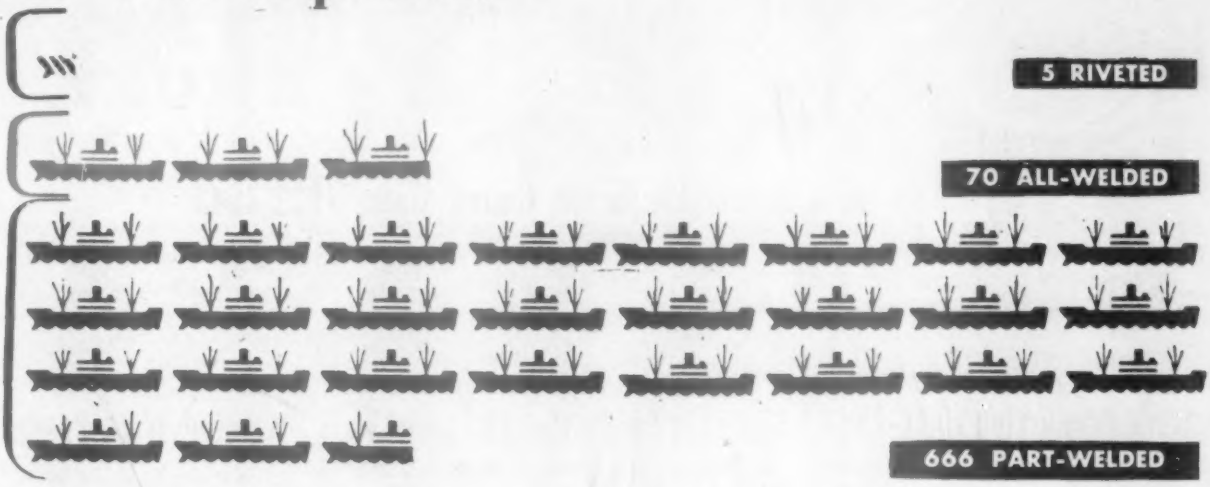
Acetylene

Welded Ships over 300 Feet Long

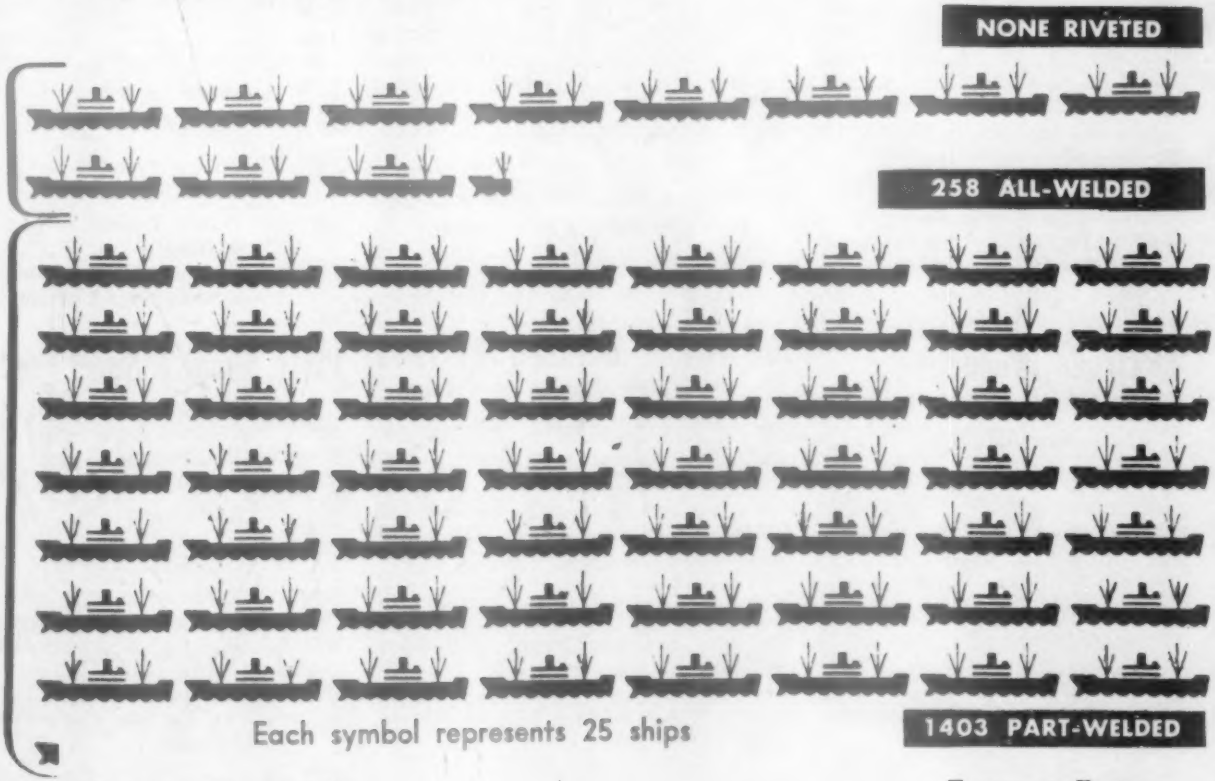
(Built to American Bureau classification)

1941— 93 Ships Built

1942— 741 Ships Built



1943—1661 Ships Built



Figures for the Facts

How the Dollars Went in the Welding Industry

	1939	1940	1941	1942	1943
Gas Welding Industry and Cutting	$49,145,540	$68,852,284	$ 79,760,483	$162,812,074	$207,884,714
Arc Welding Industry	19,395,977	47,838,020	100,437,096	128,060,195	130,131,956
Resistance Welding Industry	4,142,985	7,400,916	10,645,149	18,364,340	22,641,997
Welding Industry Totals	$72,684,502	$124,091,220	$190,842,728	$309,236,609	$360,658,667

Sources: 1939—U. S. Census of Manufacturers
1938-40-43—The Welding Engineer Industry Estimates.

How Your Welding Dollar Was Spent

	1939	1940	1941	1942	1943
Resistance Welding Industry					
Apparatus, Controls and Electrodes	$ 4,142,985	$ 7,400,916	$10,645,149	$18,364,340	$22,641,997
Arc Welding Industry					
Machines	7,293,087	19,744,600	30,952,780	46,387,330	30,624,381
Arc Electrodes	10,736,363	24,886,300	60,514,302	71,455,389	88,581,541
Accessories	1,330,527	3,207,120	8,970,014	10,217,476	10,926,034
Gas Welding Industry					
Oxygen	24,015,233	39,989,406	45,673,846	82,432,037	112,661,065
Acetylene	16,466,782	18,535,035	22,834,170	54,598,219	72,850,661
Gas Totals	40,482,015	58,524,441	68,508,016	137,030,256	185,511,726
Apparatus	3,865,065	6,196,706	7,966,048	17,434,966	16,994,384
Welding Rod	4,798,460	4,131,137	3,286,419	8,347,852	5,378,604

Sources: 1939—U.S. Census of Manufacturers
1938-40-43—The Welding Engineer Industry Estimates.

Steel Ingot Production in the United States 1932-1943

In thousands of tons

Year	1932	1933	1934	1935	1936	1937
Production	13,323	22,594	25,599	33,418	46,808	49,503
Year	1938	1939	1940	1941	1942	1943
Production	27,839	45,769	66,933	82,800	86,300	88,872

Source: 1933-1943—American Iron and Steel Institute

Electrode Production 1931-1943

	Pounds
1931	15,827,643
1932	18,800,000
1933	39,000,000
1934	57,000,000
1935	77,230,000
1936	110,330,000
1937	128,360,000
1938	97,020,000
1939	152,863,400
1940	198,995,000
1941	386,886,131
1942	745,893,457
1943	1,086,784,300

Sources: 1932-40—National Electrical Manufacturers' Association
1931, 1941-on — The Welding Engineer Industry Estimates

» «

Electrode Production

Lb. Per Ton-Plates, Shapes, Sheets

1932	4.8
1933	6.4
1934	8.4
1935	8.3
1936	7.9
1937	7.9
1938	9.9
1939	9.1
1940	10.9
1941	17.7
1942	26.4
1943	46.7

Source: The Welding Engineer Industry Estimates

Electrode Production 1931-1943

In Pounds Per Ton of Steel Ingot

1931	0.6 lbs.
1932	1.4 lbs.
1933	1.7 lbs.
1934	2.2 lbs.
1935	2.3 lbs.
1936	2.3 lbs.
1937	2.5 lbs.
1938	3.5 lbs.
1939	3.3 lbs.
1940	2.9 lbs.
1941	4.6 lbs.
1942	8.6 lbs.
1943	12.2 lbs.

Source: The Welding Engineer Industry Estimates

» «

The Welding Market 1931-1943

In Dollars Per Ton of Steel Ingot

1931	$1.58
1932	1.49
1933	1.47
1934	1.54
1935	1.56
1936	1.58
1937	1.64
1938	2.09
1939	1.55
1940	1.70
1941	2.39
1942	3.58
1943	4.07

Source: The Welding Engineer Industry Estimates

Welding Wire Production

Electrodes and Wire

	Pounds
1932	24,150,000
1933	49,450,000
1934	72,100,000
1935	97,750,000
1936	140,300,000
1937	155,310,000
1938	117,395,000
1939	183,436,000
1940	237,780,000
1941	425,574,744
1942	803,755,822
1943	1,133,876,000

Sources: 1932-39—American Iron & Steel Institute
1940-on — The Welding Engineer Industry Estimates

» «

Plate, Shape & Sheet Production

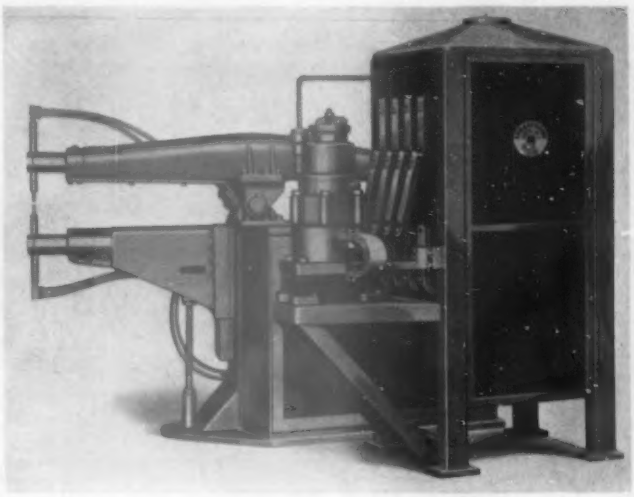
	Tons
1932	3,627,221
1933	6,005,719
1934	6,793,275
1935	9,398,320
1936	13,910,709
1937	16,082,743
1938	9,797,408
1939	16,492,952
1940	18,107,108
1941	23,342,334
1942	27,488,389
1943	23,219,605

Source: The Welding Engineer Industry Estimates

"Storage Battery" Welding

The development of electronic controls and stored energy welding were important milestones in the progress of resistance welding. Now comes a new method of using storage batteries to provide the welding current.

WHAT is believed to be the first practicable d-c resistance welder using storage batteries as a source of welding current has been announced by Progressive Welder Co., Detroit. The equipment is already in use, welding aluminum for aircraft assemblies. The use of batteries as a source of "stored energy" is said to involve no radical redesign of resistance welders, though existing types of welding machines and guns must be somewhat modified before they can be used in combination with the storage battery power unit.



Storage batteries of special design are used in this spot welder in place of electromagnetic or electrostatic methods of energy storage. Less critical adjustments are necessary, it is stated.

Advantages

Aluminum, it is stated, can now be spot or seam welded in localities where power supply limitations have hitherto precluded this operation. The use of batteries is also said to result in a material reduction in operating costs, particularly with regard to current consumption and maintenance.

Other advantages cited for the use of storage batteries for welding include:

The elimination of inductive losses in the welding "loop" by use of direct current.

The elimination of reactance losses between power supply and electrodes.

Less critical adjustments to get consistently good welds.

Greater operating and maintenance simplicity.

New-Type Batteries

Welding engineers have long known that storage batteries would provide a theoretically ideal source of welding current *IF* it were possible to accurately interrupt and control the current and *IF* batteries could be made that would stand the day-in and day-out service required. Both of these obstacles, claims Progressive, have been overcome. The battery is of an entirely new type — evolved from batteries designed to meet certain naval requirements — that will withstand high repeated-discharge rates. To use with it, there has been developed a contactor-controller which will control and interrupt the large amounts of current required.

Several types of resistance welders —rocker arm, pedestal, and gun types —may be used in combination with the storage battery power unit. From the operator's standpoint, the actual welding procedure is similar to welding with conventional welders.

Power to keep the batteries charged is supplied from an ordinary a-c power line, which may be either single or three phase. The charger, a dry-disc-type rectifier, is provided with automatic controls and normally requires no attention. At the welder itself, only a simple electronic welding sequence timer (non-synchronous) is needed for control of the welding cycle in coöperation with an automatic pressure switch and a pedal-operated starting switch. Control of the amount of welding current furnished is handled by the contactor-controller, which is stated to be capable of making and breaking tens of thousands of d-c amperes at low voltage without arcing.

Electrical Characteristics

The current is controlled with but a single adjustment—that of pressure. The principle is that of the well known "carbon-pile," although the pressure required may be as high as 25 tons for the welding of aluminum. The current is automatically varied by changes of pressure, and the current flow will stop altogether when the pressure has dropped to zero. Thus interruptions of the welding current without arcing are made possible.

The voltage drop from battery to electrode is much less than that between the electrodes and a conventional welding transformer. The low voltage direct current used is said to provide a more constant effective value of welding current, making weld characteristics less dependent on accuracy of control of the time cycle.

Elimination of induction losses in the welding loop means that current passing through the weld will always be exactly the same, regardless of how deeply a panel is inserted in the throat of the welder. The elimination of reactance losses between the power source and electrodes is reflected in the reduction in voltage mentioned in the previous paragraph. The only reactance loss in the storage battery type of installation is said to be that due to the low electrical resistance of the cables and conductors themselves.

One advantage not yet mentioned is the fact that storage battery welders will operate with virtually unity power factor. This makes unnecessary the installation of corrective electrical equipment to compensate for high instantaneous power loads. The battery charger imposes a low and constant line load, allowing the equipment to be used in communities where power supply is limited.

Maintenance

The simplicity of the contactor-controller and the elimination of transformers, synchronous heat controls, etc., make it possible to maintain the equipment with only a normal amount of mechanical skill, it is claimed. Under average production schedules, the batteries will require inspection and the addition of water about once a week.

★ RESEARCH

Aluminum Cleaning Methods

By ARTHUR S. KOHLER
Research Director,
Frederick Gumm Chemical Co.

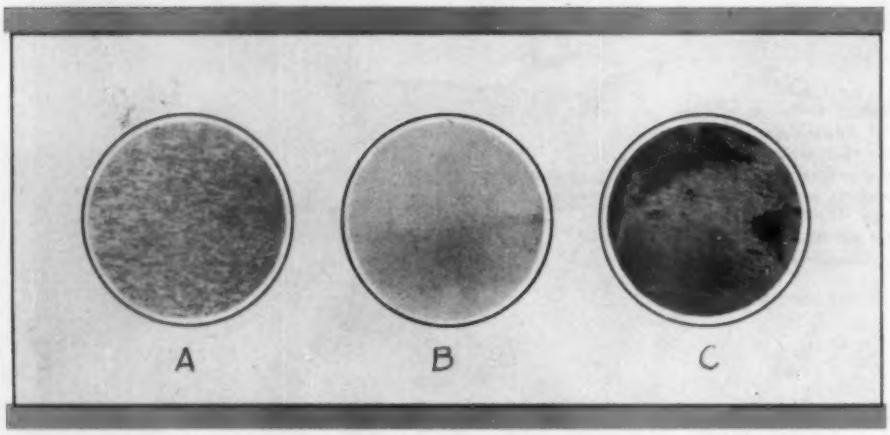


Fig. 1—A and B show respectively the flaky and satin-smooth finishes which are possible to obtain with alkaline etches. Such etches, however, do not etch all aluminum alloys with equal regularity as is evidenced by C, which was obtained from the tough skin of a heat-treated alloy.

ALUMINUM stock is oiled at the rolling mill with a mixture of mineral oil plus a small amount of drying-type animal oil. The stock may also be marked with pattern ink or wax pencil; in the case of deep drawn stock, a heavy sulphurized drawing compound may be smeared over the entire surface. Below the oily layer lies a film of oxide of various degrees of purity. All of this extraneous material must be removed very thoroughly before the metal is spot welded.

It is possible to weld aluminum without deoxidizing it, but scarcely desirable since the irregularities in the surface film will preclude uniform, consistent spots. Spitting, cracked spots and weak spots will be frequent and electrode pickup excessive. For un-deoxidized aluminum, possibly 10 or 20 spots can be obtained between electrode cleanings whereas with an oil-free, oxide-free surface as many as 300 to 500 spots are possible.

Lower Electrical Resistance

Since spot welding depends on the heat generated (at the surface of contact) by the flow of electric current through a resistance, it is obvious that both of these quantities have an important bearing on the formation of the weld. If the total resistance is low, a large current can flow and generate a large amount of heat for welding. Studies of the resistance between faying surfaces made by the Welding Laboratory at Renssalaer Polytechnic Institute by means of the Kelvin Bridge technique have shown that successful welding of aluminum can be accomplished only when the resistance between the sheets is less than fifty microhms (0.000050 ohms). The surface resistance of two pieces of aluminum that have been carefully cleaned with a wire brush or steel wool (and immediately measured) is about four or five microhms. It is evident that so low a surface resistance will in general be excellent for good spot welding.

While aluminum cleaning is done primarily for obtaining of a weldable surface, it frequently happens that the manufacturer desires also to give the surface a decorative finish. It is perfectly possible to combine these two functions in certain types of cleaning operations and this is the practice in many companies today.

In general the preparation of the stock for welding has two principle steps: (1) the removal of oil, grease and marking ink, and (2) the removal of the oxide coating (deoxidation). We shall consider these as two distinct steps.

Oil Removal

The first task is usually accomplished by soaking the metal in a hot (160-200 F) alkaline solution for from two to ten minutes, depending on the type, age and quantity of oil present. Since ordinary alkaline cleaners such as would be used for steel are far too caustic for aluminum, it is necessary to use degreasing solutions which contain suitable inhibitors or are buffered to keep the alkalinity low. The degreasing solution should also contain suitable emulsifying agents so that the oil from the stock will not form on the top of the solution an oily layer through which the

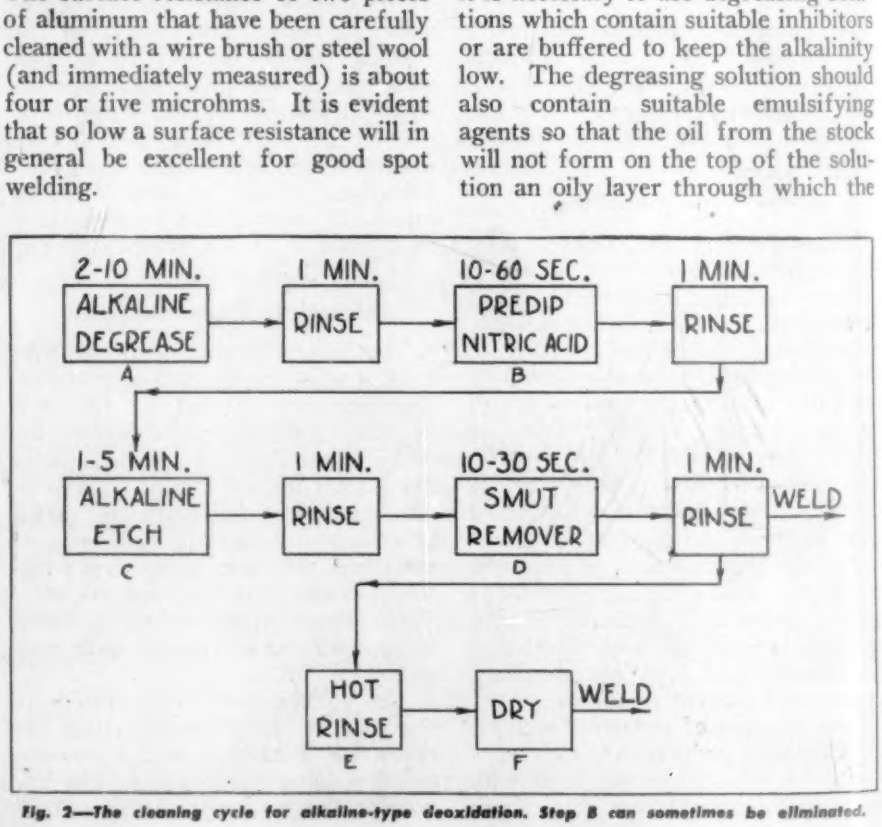


Fig. 2—The cleaning cycle for alkaline-type deoxidation. Step B can sometimes be eliminated.

The spur of wartime necessity has developed effective new techniques for speeding aluminum spot welding. Of these, improved chemical cleaning techniques have probably contributed as much as anything else to reduce the frequency of spot welding engineers' headaches.

metal may again be partially coated with oil.

Ultimately, any cleaner will become saturated with oil, and there will be some separation. Any oil floating on the surface should be promptly skimmed or else a fresh solution prepared. After degreasing, the parts must be well rinsed in running water and drained. If they have been properly cleaned, their surfaces will be entirely covered with a thin film of water and will remain for ten to twenty seconds without that film breaking.

For the stock which has a heavy oil coating or which has been coated with a heavy drawing compound, a preliminary degreasing with a solvent will be found desirable. This generally consists of a dip in a suitable cold organic solvent for ten to thirty seconds, followed by a short draining period before immersion in the alkaline degreasing solution. The solvent used should be non-toxic, have a high flash point and be non-irritating to the eyes and skin, while the tank should have suitable forced draft ventilation. Vapor phase degreasers are not satisfactory for sheet aluminum degreasing as a rule.

Deoxidation

Deoxidation, the second step in the cleaning cycle, may be considered under two main heads: (1) mechanical and (2) chemical.

Mechanical deoxidation employs steel wool, emery paper or the wire brush. This method is laborious and has other disadvantages. On clad stock, for instance, it is very easy for a careless or inexperienced operator to cut through the cladding and expose patches of the alloy beneath. Also chips of abrasive, steel wool, etc., must be very carefully removed from the area to be welded.* On the other hand, if only a small area of a comparatively large sheet is to be welded, it is simpler in some cases to confine the cleaning to that particular area rather than to clean the whole piece by chemical means. Furthermore, adequate tank facilities may not everywhere be available for a bulky piece.

Chemical deoxidation is subdivided into (*a*) alkaline and (*b*) acid types. Both of these types are in current use, and each has its definite field. As a general rule, both bases and acids will attack the chemically active metal more readily than the inert oxide, which fact is rather unfortunate from the deoxidation standpoint. Nevertheless, a properly compounded deoxidizing solution (acid-type) will remove the oxide film and *not* remove the base metal any faster than about 0.000,001 in. per minute.

Alkaline Deoxidation

After degreasing in the alkaline cleaner and rinsing, the parts are immersed in a hot (150-200 F) and strongly alkaline solution for from one to five minutes. Caustic soda at a concentration of 6 to 8 oz per gallon may be used for this purpose. The action on the aluminum is very vigorous; large amounts of hydrogen gas are given off, and the aluminum is etched rapidly. In some cases, as much as 5 to 10% of the metal may be dissolved in ten minutes. It is easy to see that such rapid dissolution might remove all the cladding of clad aluminum, and in any event the ultimate strength of the metal is seriously decreased. Another drawback to the alkaline etch is its short life because of excessive reaction with the base metal.

The use of caustic soda leads to the formation of a hard, dense white aluminum oxide scale on steam coils and tank walls. This should be removed (cold chisels are the best method) when the tank is dumped. Proprietary alkaline etching deoxidizers which do not form scale in the tank are available; these also have a less violent action on the metal and are so compounded that the liberation of the hydrogen bubbles is not accompanied by an irritating spray of caustic droplets.

The alkaline etch has its place in the production of parts for which a satin finish is desired. The alkali removes surface scratches and irregularities, and leaves a pleasing appearance. In some cases, it is possible to obtain a flaky crystalline finish (Fig. 1A) or a smooth satin finish (Fig. 1B).

Effects of Alloys

Commercial aluminum is not pure but contains in most cases alloying ingredients such as copper, manganese, magnesium, zinc, chromium, etc. Many of these constituents are not soluble in alkalis and so will accumulate on the surface as the aluminum dissolves. This gives rise to a smut varying in color from pale gray to jet black. As a rule, the smut is quite loosely held to the metal and can be wiped off, but wiping would not be practicable as a shop procedure. After the rinsing which follows the alkaline deoxidation, the smut is usually dissolved by immersing the material for 10 to 30 seconds in a cold nitric acid solution (25 to 50% by volume) or in some of the proprietary smut removers.

In heat-treated alloys such as 24S-T, a very refractive skin seems to be formed on the outside of the ordinary oxide film. This skin is not attacked readily nor uniformly by alkali solutions (see Fig. 1C). It can, however, be readily removed by

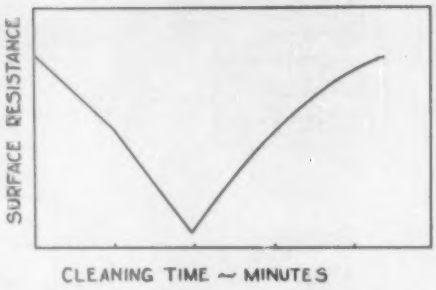


Fig. 3—Effect of hydrofluoric acid on the surface resistance of aluminum. Note the extremely small critical time.

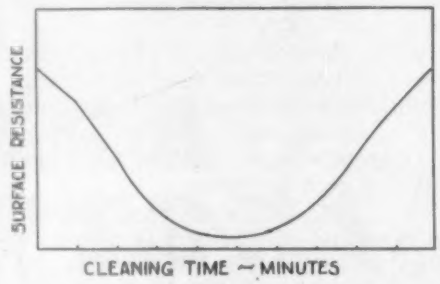


Fig. 4—Less critical than Fig. 3, these solutions still show a marked increase in resistance if the stock is left in them too long.

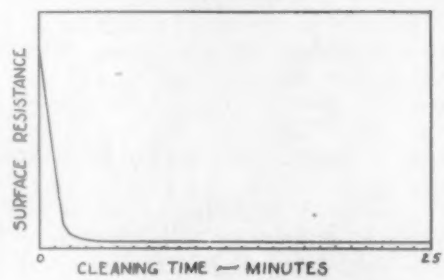


Fig. 5—To be compared with the curves of Figs. 3 and 4 is this curve for a new proprietary deoxidizer. Note that prolonged immersion in the solution has virtually no effect upon surface resistance.

*Navy specifications call for the use of stainless steel wool to avoid chips—*The Editors*

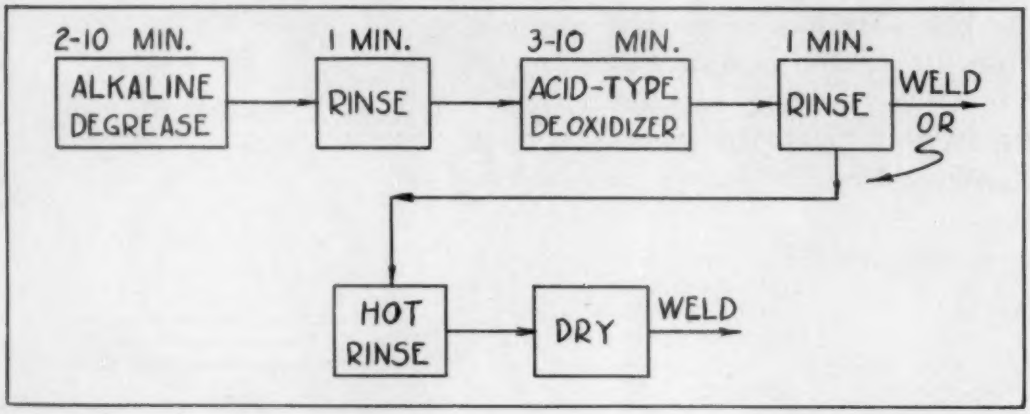


Fig. 6—Cleaning cycle for acid-type deoxidizer: (compare with Fig. 2).

treating the material for 10 to 60 seconds with cold dilute nitric acid, ferric chloride or even salts such as alum or ammonium chloride. The material is then rinsed and treated with the alkaline etch as before.

The complete cycle for alkaline etching and deoxidation is shown in Fig. 2. Step B can sometimes be eliminated and of course steps E and F are eliminated if the material is welded wet.

Acid Deoxidation

Because of the rapid attack of alkali deoxiders on aluminum, there has been a decided trend toward the use of acid deoxidizers. While these, too, attack the metal, the rate of attack is far less rapid and can be more readily controlled. As with the alkaline etches, it is necessary to use an alkaline degreasing solution before the acid treatment; it is, in fact, even more imperative to have an oil-free surface for acid deoxidation since the acid itself has no oil-removing properties of its own.

One of the first acid-type deoxidizers tried in production was hydrofluoric acid — used both as an immersion cleaner or made into a gel with gum tragacanth and painted on the aluminum. The latter method was sloppy to use and was, moreover, hazardous to the worker since hydrofluoric acid is quite poisonous. Nor was H_2F_2 much more satisfactory as an immersion deoxidizer since it is extremely critical as regards time of immersion, temperature and concentration. If the aluminum is etched even a little longer than it should be treated, the surface resistance increases to the point where a satisfactory weld can no longer be produced.

The effect of hydrofluoric acid on the surface resistance of aluminum is shown in Fig. 3. The reason for the rise in surface resistance is that some of the alloying constituents of the aluminum are either not soluble in the acid or their rate of solution is too slow. Consequently, there is an accumulation of a residue at the surface of the aluminum. Having melting points much higher than aluminum, this residue does not melt when the part is spot welded but instead forms a layer of poor bonding quality. This results in a weak weld spot (if *any* weld is made) and tends to increase pick-up and cause more frequent electrode cleanings.

Combination Cleaning Agents

At this point it might be well to mention that there have been many attempts to produce a single cleaning material which would both degrease and deoxide with a single immersion. As yet, however, no satisfactory acid-type oil emulsifying agents which are at all comparable with the alkaline type have been found. And while alkaline baths are excellent for oil removal, they are objectionable for deoxidation in many cases because of the rapidity of their attack on aluminum. Furthermore, the presence of emulsifying agents in an alkaline deoxidizer causes excessive foaming due to the evolution of gas. Hence, if the functions of degreaser and deoxidizer are to be combined in a single agent, one is faced by the fact that some desirable elements in one step or the other must be sacrificed.

Effective Acid Deoxidizers

Numerous acid-type deoxidizers have come into commercial use. Among them may be mentioned bisulphate, fluosilicic acid, phosphoric acid, phosphoric-chromic acid combinations and many proprietary deoxidizers. Though less critical than hydrofluoric acid as far as reaction time is concerned, such solutions all have resistance vs. deoxidizing curves similar to Fig. 4. Practically all of them will show a marked increase in surface resistance if the stock is left in the solution too long.

Recently, there has appeared a new proprietary acid-type deoxidizer which has a long life, is not at all critical and yields such a surface resistance curve as is shown in Fig. 5. While the surface is perfectly deoxidized in three minutes in a solution at room temperature, the aluminum alloy can be left in for half an hour with no change in surface resistance. (The resistance is the same as is obtained by well prepared mechanical cleaning.) Another distinct advantage of this deoxidizer is that it leaves a passive surface which does not deteriorate appreciably during weeks of storage.

The cleaning cycle for acid-type deoxidizers is given in Fig. 6. In the case of deep drawn stock, it may be necessary to remove most of the heavy drawing compound with a suitable solvent as previously described. The hot rinse and drying steps are, of course, optional.

For a Longer Tip Life

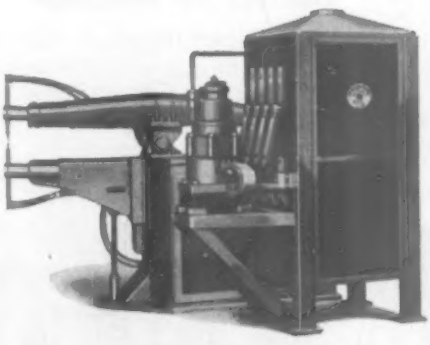
The number of spots obtained between electrode cleanings is a function of more than one variable. In general, welding tips should have satisfactory refrigeration at all times and the electrodes must be firm and without any side-play since even a slight lateral movement may cause mechanical abrasion and pick-up. Given these conditions, the surface of the aluminum to be welded should be thoroughly and uniformly clean.

After a dependable degreasing and deoxidizing cycle has been adopted for production, the welding machine settings should be carefully determined for each type of alloy and thickness. The current should be so adjusted that only enough heat is developed to yield a spot of the specification shear strength; the use of more current than this may increase shear strength, but it will definitely decrease the tip life. Finally, the material should not be exposed to a corrosive atmosphere or to excessive dust, dirt, or oil after deoxidation and should be handled as little as possible until welded.

Recently, experimental work has been done in connection with coating the aluminum with a very thin lacquer film. When the metal was coated (either by dipping or spraying) prior to storage and subsequent welding, it was found that the number of spots obtained was several times as great as with stock cleaned under the same conditions but left exposed. Whether or not the application of a protective resin film to the aluminum surface before welding will ever become commercially feasible, the new development has interesting possibilities.

Announcing "STORAGE BATTERY" WELDERS

by PWC



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Prefabricated Ship Piping

Installation of the 32,000 ft of piping a Liberty Ship needs is a task requiring welding under confined conditions and fitting in almost inaccessible places. The job can be greatly simplified, however, by doing much of the fitting for final assembly *outside* the shiphold.

By **IVAN CHAPMAN**
Pipe Shop Superintendent,
Oregon Shipbuilding Corp.

THE installation of the various piping systems in a Liberty ship is a much larger task than the outsider realizes. It is estimated that there are approximately 32,000 lineal feet of piping, forming many circuitous passages about the ships. The many different piping systems form a complicated network throughout the entire vessel. Pipe runs around every deck, around thousands of corners, is twisted in and out of the maze of machinery that is required to operate the modern ship.

The Old Way

When ships were not built at present-day production schedules of six or seven a day, ship piping was installed in comparatively leisurely fashion. The pipe shop was the center of activity. Here the pipe was cut, bent and fitted according to the requirements specified on the blueprint—and later by the "cut and try" method. Piece by piece, the pipes were then hoisted into the hulls. Even though they had been cut to fit their destined locations, it was necessary to return many pieces to the pipe shop for more cutting and fitting. Variations in machinery construction were one of the greatest causes of this trouble. Eventually, however, the pieces would be ready to be welded or bolted into place.

As the demands for cargo space increased and engine rooms decreased, it became advantageous to use more welding and more welding fittings. Because of the lack of space, however, welding and fitting had to be done under cramped conditions in almost inaccessible places. Offsetting this difficulty somewhat, the use of welding fittings made it possible to make the piping systems more compact. Nevertheless, the job was difficult under the most favorable circumstances, and the problems connected with the installation of ship piping consequently became serious.

Avoiding the Bottleneck

These problems tended to increase in complexity until finally pipe installations became a major bottleneck in the speeded-up production programs being undertaken by most of the nation's shipyards. Scheming for

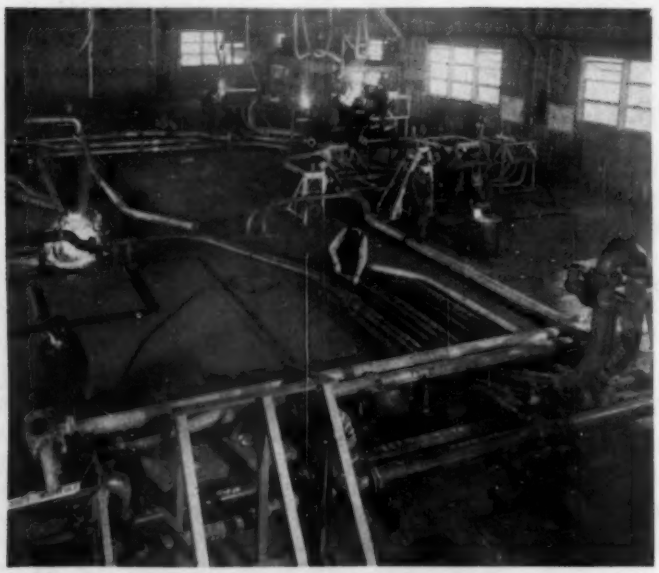
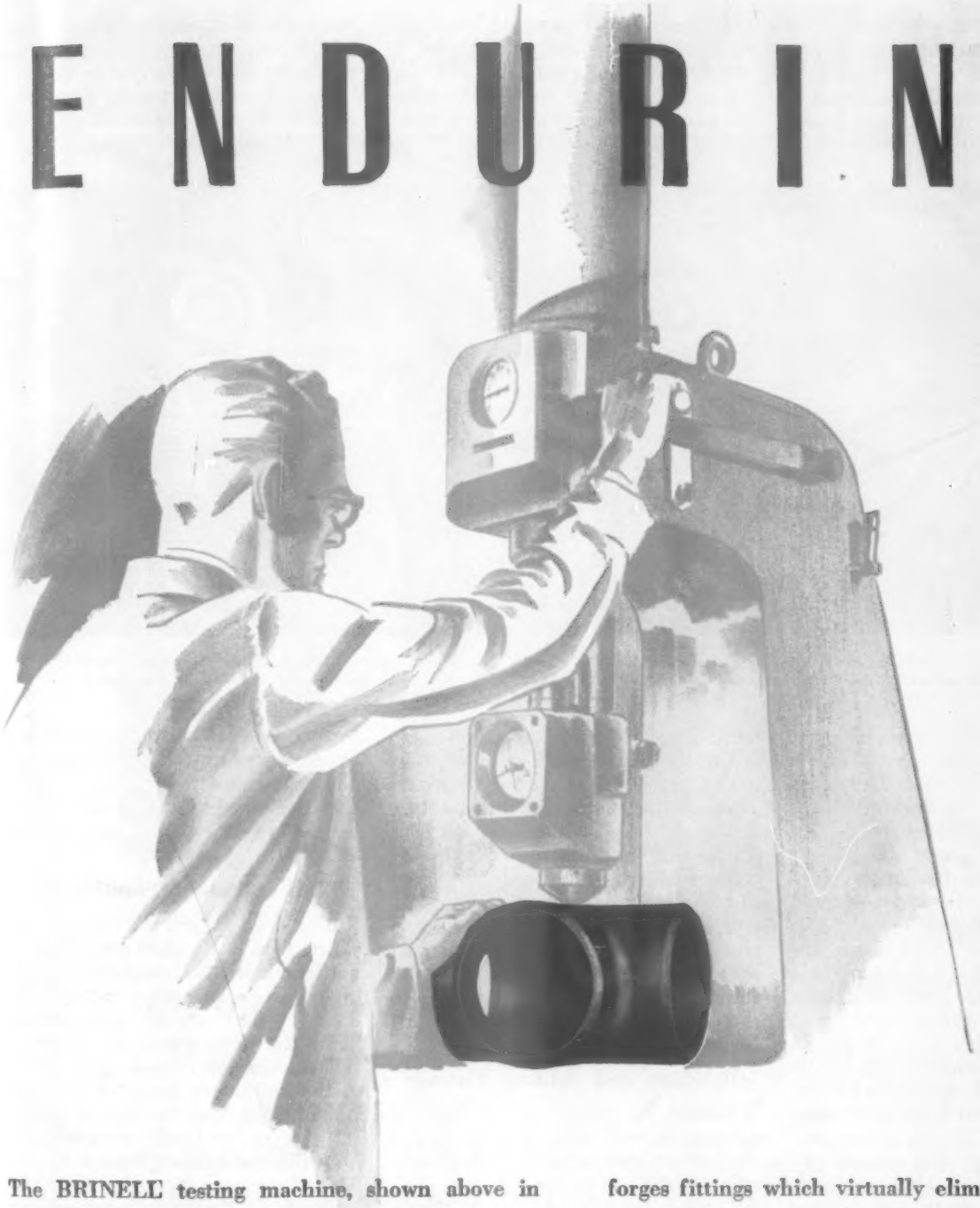


Fig. 1 (left)—The machinery space in a Liberty ship has been accurately laid out on this loft floor. Note the name plates on the jigs, which represent various machinery items. Fume exhausters can be glimpsed in the background.

Fig. 2 (below, left)—Oil-fired heating torches are used to aid pipe-bending operations.

Fig. 3 (below, right)—Elbows and other types of welding fittings are welded to straight runs of pipe in the pipe shop.

ENDURING



The BRINELL testing machine, shown above in Tube Turns' laboratories, scientifically determines the hardness, or wear resistance, of finished fittings.

Endurance is indispensable in welding fittings, for the destructive forces in piping — strain, pressure, vibration, corrosion and erosion — are more *highly concentrated at the fittings.*

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Welding Fittings and Flanges

methods to break this bottleneck, we decided at Oregon Shipyard to prefabricate as much of the piping as possible. Then installations could be assembled outside the hull and placed in the ship in the largest possible units. To make this plan operative, however, it was necessary to insure accuracy in prefabrication. This could only be done by duplicating in the pipe shop the conditions to be encountered in the ship.

Aided by marine machinists, shipwrights and the drafting department, the pipe assembly department was able to convert the 60 by 280 ft loft of the pipe shop into a full-sized model of the machinery space area in a ship. This is shown in Fig. 1.

The pipe assembly crew, it should be noted, is responsible for the installation of: (1) fuel oil transfer lines, (2) fuel oil service lines, (3) bilge and ballast lines, (4) salt water suction and discharge lines and (5) water, feedwater and blow-off lines. Accordingly, the first step in the preparation of the full-scale model was to lay out these various systems on the loft floor. Each piping system is designated by colored lines on the floor—a different color for each of the five systems which the department fabricates.

Jigs Represent Machinery

To simulate actual machinery space conditions, the various items of ship machinery and equipment are represented throughout the space by jigs and fixtures. These jigs and fixtures have structural steel frames (in many instances they are structural weldments), are of an elevated nature and have actual openings and fittings which correspond to the item of machinery they represent. To facilitate identification, the name of the equipment for which the jig "stands" is clearly indicated (note Fig. 1). The jig is also painted to correspond to the particular piping system of which it is a part. The jigs are adjustable both vertically and horizontally, enabling the workman to regulate them to changes in the ship's specifications.

While the final prefabricated assembly is made in the loft, much of the bending and much of the preliminary welding is done on the first floor of the building which houses the pipe shop. After standard lengths of pipe have been cut for a specific part of the piping system, they are sent either to the other portion of the pipe shop for further work or to the loft for assembly.

Bending and Adding Fittings

Should the plans call for bending (piping is bent wherever practicable to eliminate cutting and welding operations), the job is done in the shop. All pipe is bent by bending machines, and if correction is necessary the piece is put on a grilled face plate and heated with oil-fired preheating torches until it can be bent to the desired angle. A typical heating operation is pictured in Fig. 2. Another job that is usually undertaken in the pipe shop before sending the piece to assembly is pictured in Fig. 3. This is the joining of various types of welding fittings to straight runs of pipe.

Adequate space is provided in the pipe assembly loft for a crew of 40 or more weldors and pipefitters, who put on flanges, weld connections, adjust lengths and otherwise handle about 85% of the pipe fitting which was previously done in the hull. So that the pipe will conform to the floor lines and diagrams, a series of hangers is used to elevate the sections in place while they are being fitted. These hangers may be clearly seen in Fig. 4.

As the various piping systems are assembled, they are marked with the color identification corresponding to the particular system involved. Adjoining sections are clearly numbered and striped with the proper color so that the pipe may be readily identified after it leaves the pipe assembly loft.

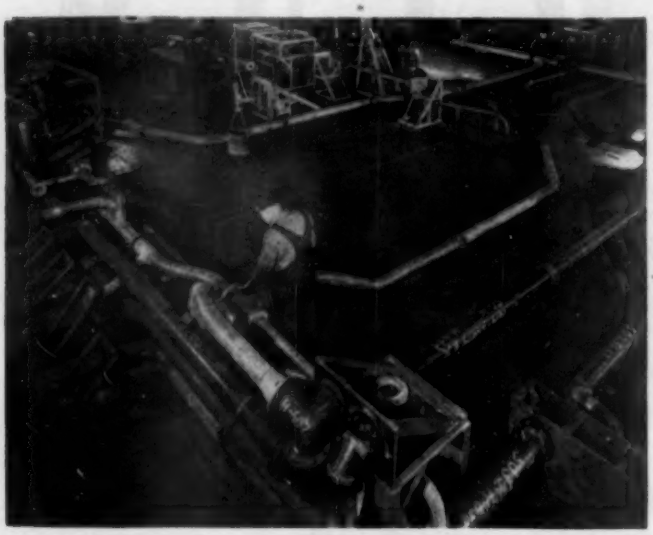


Fig. 4—So that the pipe will conform to changing floor lines, a series of hangers elevate the sections in place while they are being fitted.

Fig. 5—Prefabrication affords the welder much freer movement in the assembly of ship piping.

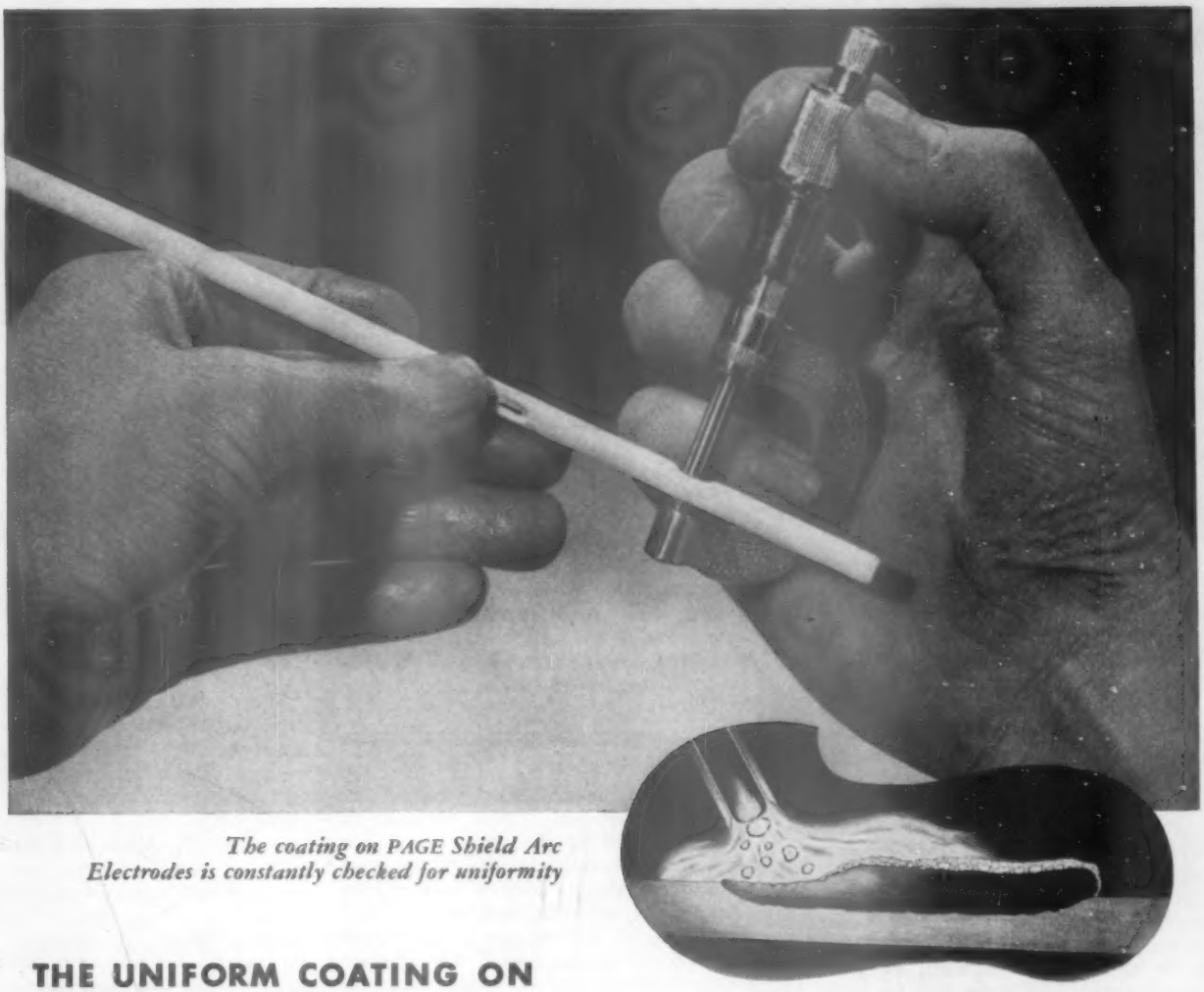
Ventilation Simplified

The development of this prefabricating plan has broken more than one bottleneck in the installation of ship piping. Besides cutting down welding done in the hull by approximately 85%, the new system has helped to relieve congested working conditions in the machinery space of the unfinished hulls. Also, the hazard of metal fume fever has been completely eliminated by the welding fume exhausters which have been located at convenient intervals in the loft (refer again to Fig. 1). These carry away all welding fumes.

Prefabricated ship piping has also helped to cut down transportation time by eliminating most rejections of materials and has enabled the hulls to receive pipe installations as complete systems. Inasmuch as the pipe is not handled as many times as it was formerly, losses due to breakage and errors have been reduced. Needless to say, the fitting has been made much more accurate.

As can be readily seen, this ingenious method of prefabricating ship piping affords many advantages at Oregon Shipyard. Our next move will be toward prefabricated overhead piping installations so as to cut down production time still further.

PAGE *Welding* ELECTRODES



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Short Cuts and Kinks

The Exchange of Ideas Leads to Progress

Edge-Burning Device

By **A. H. PRIVETT**

I DEVELOPED a torch-holding attachment for flame-cutting machines used in trimming the edges of plates for shell and bulkhead units. Prior to the introduction of this attachment, the procedure at Richmond Shipyard No. 1, Richmond, Calif., was to space the edges of plates to be flanged together and burn these confronting edges by passing twin torches therealong. In order to hold the plates in correctly spaced relationship, numerous ties were employed to tie the edges of the plates together. To allow the passage of the twin torch rig along the plates, stoppages had to be made to remove and replace the ties. Since these stoppages caused unevenness in the plate edges, several fits and grindings of the plate edges were usually necessary before a satisfactory flanging job could be secured.

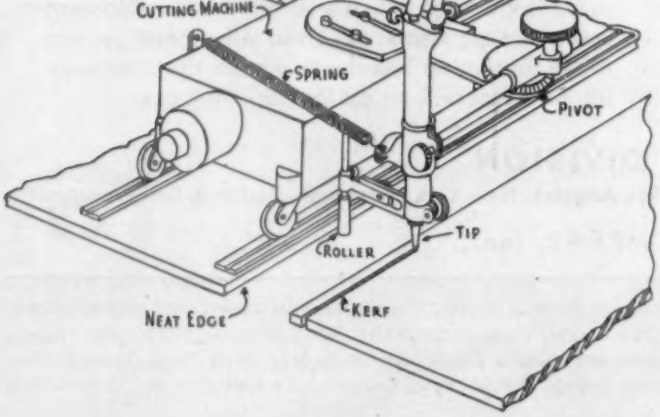
In the improved device, one torch has been eliminated and replaced by a roller. Traveling along the trimmed edge of the center plate of the shell and bulkhead units, the roller creates a duplicate of that trimmed edge along the adjacent edge of the neighboring plate. Since their edges are duplicates, the plates may be butted together to form a perfect fit. This speeds up the flanging operation and also improves the submerged melt seam.

Prior to the introduction of this attachment, the procedure in trimming shell plate had been to overlap the weld edge of the bottom plate with the neat edge of the center plate of a shell unit. These plates were then tacked together by means of special saddles, while any irregularities in the burned edge were ground. The plates were tested for fit and successively ground and fitted until the edges came together satisfactorily. Using this method, a crew which succeeded in flanging five of these shell plates would have put in a good shift.

Under the new system, using the apparatus illustrated by the accompanying sketch, the plates may be spaced anywhere from 2½ to 6 in. apart as long as their respective edges are nearly parallel. The flame-cutting machine is then run along on a track carried by the center plate. The torch trims off the weld edge of the other plate to the exact contour of the neat edge since it is guided along, and held in spaced relation to, the neat edge by a roller which bears against the latter edge. The trim cut exactly duplicates the neat edge of the center plate, and the plates may be immediately flanged together to form a perfect fit.

With this apparatus, it is now possible to cut and flange 14 plates per shift as against the previous five per shift. The neatness of the joint speeds up the work of both flangers and welding crew since there is now no blow-through on the tightly jointed plates.

Below: Cutting machine attachment developed to facilitate the trimming of plate edges for shell and bulkhead units at Richmond Yard.



Help Wanted, *please!*

THOUGH the exchange of ideas among workers and managements is valuable in peacetime, it is invaluable in time of war, for such an exchange may help materially to shorten the conflict. Hence the appearance of "Short Cuts and Kinks," a new department of THE WELDING ENGINEER. On these pages the editors hope to pass on to you ideas which will: (1) save time and money and (2) help to make difficult jobs easier and hard work more pleasant.

This is the one place where you may "get more than you put in," for all the ideas given here are yours without contributing anything in return. Don't be that kind of fellow, though! If you have a welding idea to pass on, then get the kick of seeing your name in print, help others to win the war and help us to keep this feature alive. Send anything you think suitable to Short Cuts and Kinks, THE WELDING ENGINEER, 506 South Wabash Ave., Chicago 5.—*The Editors.*

Projection-Welded Ladders

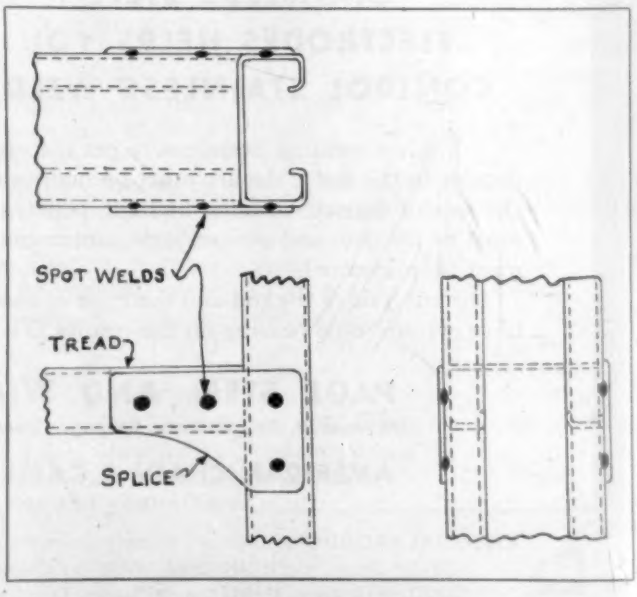
By **WILLIAM H. GIBBS, JR.**

IN BETHLEHEM'S Fore River Yard in Quincy, Mass., it has been the general practice to arc weld ladders. As a rule about ten ladders would be welded in an eight hour shift. Quantity was low because it was necessary to grind the excess weld metal off the surface of the treads, sandblast the scale off the welds, galvanize the ladder after welding and then straighten the ladder after galvanizing. All in all, building a ladder was rather a tedious job.

In view of these difficulties, I suggested a plan for projection spot welding ladders to the War Production Committee. This suggestion was accepted, and as a result I received a War Production Award.

Spot welding now makes it possible for us to build 30 ladders in an eight hour shift. Since we are now able to use galvanized material, all postweld grinding, sandblasting and straightening operations are eliminated.

The sides and tread of the ladders are formed of No. 16 gauge Galvaneal. These parts are joined by projection welding of 14 gauge Galvaneal splice plates with four projections, as indicated in the accompanying illustration. The ladder is completely assembled in a jig, and the splice plates are welded to the tread and the sides, two projections at a time. We use a standard spot projection welder of 60 kva capacity operating on 440 volts.



Above: Detailed plan showing method of constructing ladder by means of projection spot welding.

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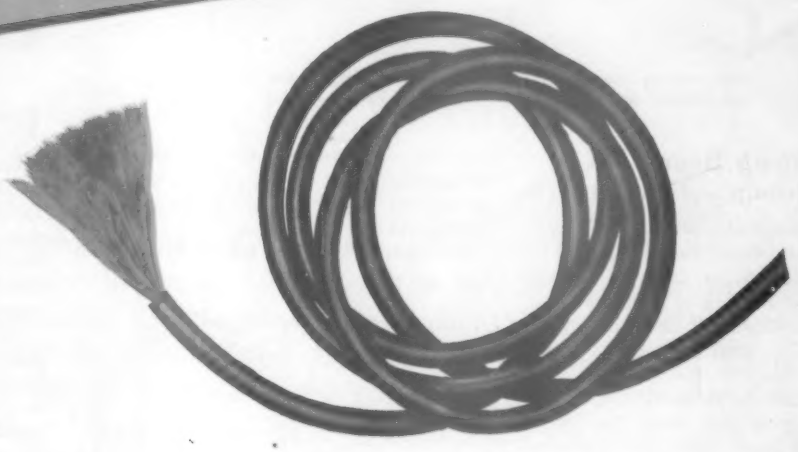

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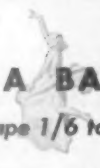

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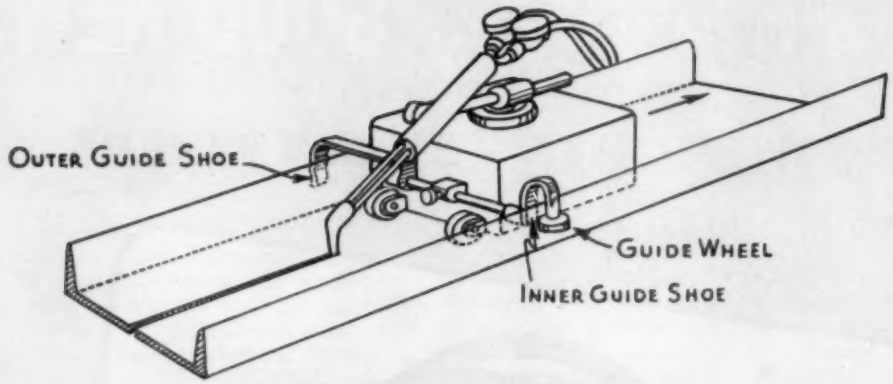
If you have a proper priority, and your local distributor cannot offer you prompt shipment, send us his name and address, and we will arrange to meet your needs to your satisfaction.

NOTE: Good territories still open to responsible distributors.



Flame-cutting machine guide which makes possible the longitudinal splitting of 60 ft I-beams or channels

Flame-Splitting Beams

By **M. McDONOUGH** *and* **J. RUDINOW**

SHORTAGE of material renders it necessary at the present time for us to cut up I-beams or channels in order to obtain T- or L-sections for use as stiffeners, etc. The former practice was to cut a 60 ft beam into 10 ft lengths, transport the resulting sections to an adjacent area and then split them longitudinally by flame-cutting. Since these beam sections were much too heavy to be carried by hand, their transportation required the services of a crane, several laborers and a rigger.

We submitted to the War Production Drive Committee at Richmond Shipyard No. 1, Richmond, Calif., an improved system which uses the flame-cutting machine guide illustrated to separate the parent beam by a longitudinal cut running the full 60 feet of the beam. The needed 10 ft sections are then cut transversely.

The split lengths are light enough to be carried to wherever desired by a pair of laborers. Furthermore, the burned edges of the beams are cleaner and straighter and a material reduction in production time is achieved.

This comparatively simple suggestion makes it possible to save considerable time and produce better results. It now requires only one machine set-up to cut a 60 ft beam where it had previously required five; this alone saves about 1½ hours per beam. In addition, the crane, riggers, two laborers and a flame-cutting machine operator have been eliminated.

» «

Cutting Pipe for Elbows

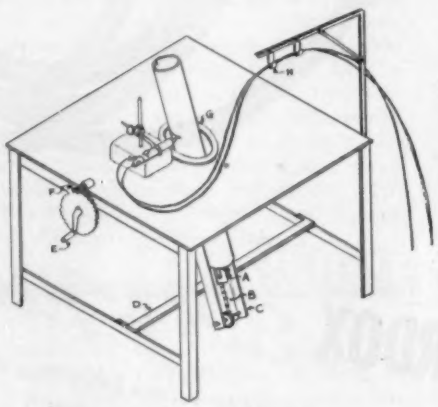
By **WALLIS A. SAWYER**

CUTTING the ends of pipes so that they may be joined together to form elbows is quite a job. In the Oregon Shipbuilding Corp., Portland, we used to do it by the following procedure, when three pieces of pipe were used to form a 90 deg elbow:

Two pieces of pipe were cut square on one end and at a 22½ deg angle at the other. One piece was cut at a 22½ deg angle at both ends. The last-mentioned piece was first flame-cut by hand to the proper length and then marked from paper templates for the 22½ deg cuts. The torch was guided by hand along the mark around the pipe.

Since it is extremely difficult to make an angle cut true, much hand trimming and grinding were required to make the pieces fit together after cutting. Often, excessive amounts of weld-metal had to be deposited in order to close large gaps.

I conceived an idea for a fixture that would make it possible to machine-flame-cut the pipe on a plane at any angle to the pipe's axis. I submitted the idea to the Labor Management Committee and was subsequently given an award upon its adoption. The machine built is very similar to that shown in the sketch (in center column).



Fixture for machine-cutting of pipe at any desired angle. A—cam clamp to hold pipe; B—roller chain attached to clamp; C—carriage hinged to table top; D—angle holder to support carriage (lug set on brace for 22½ deg); E—handle for vertical adjustment; F—catch to hold chain; G—raised elliptical ring to guide torch; H—swinging holder for hose. The sprocket on the end of E raises or lowers roller chain and pipe.

The cut and marked pipe is fastened on the machine carriage; the angle of cut is set by a crank, and the torch is adjusted for distance. The flame-cutting machine runs against the elliptical ring, making a smooth, true and plane cut. After cutting, the pipe lengths may be assembled without hand trimming or grinding, and they will form the correct angle with a maximum gap of ⅛ in.

The use of this device is estimated to save 18 man-hours per ship in the assembly and welding operation.

» «

Welding Pipe Sleeves

By **VON H. ORFIELD**

I SUGGESTED to the Labor Management Committee at Gulf Shipbuilding Corp., Mobile, Ala., that a change be made in the welding sequence used for attaching pipes to bulkheads or tank tops. My idea was that: (1) all welding necessary on the pipe itself be done before placing it in position and (2) sleeves be welded to the pipe at this stage rather than in the bulkhead.

By the previous method, a weldor had only one chance to stop a leak on a bulkhead weld. Now he has two. And instead of welding the sleeve in a tight place where good welding is almost impossible, he can turn the pipe and make a good weld.

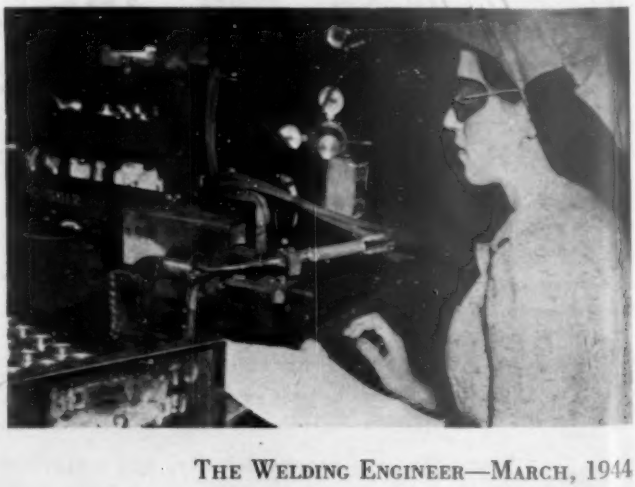
Result: a saving of 25 man-hours per ship.

» «

Flame-Cleaning Fixture

AN AUTOMATIC fixture developed by A. J. Green, a general foreman at one of General Electric's plants, has materially speeded the operation of flame-cleaning the surfaces of small laminated cores for aircraft instrument motors. The operation was previously performed manually and required the movement of a high-temperature oxidizing flame across and around the core. This was both slow and difficult because the flame movement had to be steady in order to destroy small burrs and otherwise properly treat the surface.

In Green's automatic fixture, a weldor's torch is mounted on a sliding block driven by a crank wheel. The core is placed on rolls and rotated at a speed regulated to the cross-wise travel of the torch, to permit the flame to be carried back and forth along the slots and surface of the bore. The core is removed after it has made two or three complete revolutions.



Automatic fixture designed to speed the flame treatment of cores for aircraft instrument motors.

Courtesy, General Electric Co.

Who Makes ? It?

The Welding Engineer's 1944 ANNUAL DIRECTORY

Here's where to find out who makes 242 welding and cutting products. Look for the classification wanted alphabetically under its most important word—usually, though not always, a noun. For example, on this page: "Acetylene, Dissolved" and not "Dissolved Acetylene." Sometimes, though, the key word is an adjective; for example: "Abrasive Belts" rather than "Belts, Abrasive," "Induction Heaters" not "Heaters, Induction" and "Arc Welders, A-C" instead of "Welders, Arc, A-C" or "A-C Arc Welders." Under each classification, companies are listed alphabetically for quick reference, and their postal district numbers have been included with their addresses.

ABRASIVE BELTS

Abrasive Products, Inc., So. Braintree, Mass.
Behr-Manning, Troy, N. Y.
Carborundum Co., The, Niagara Falls, N. Y.
Goodyear Tire & Rubber Co., Akron, O.
Stow Mfg. Co., 443 State St., Binghamton, N. Y.
Walls Sales Corp., 96 Warren St., New York 7

ABRASIVES

Abrasive Products, Inc., So. Braintree, Mass.
Behr-Manning Corp., Troy, N. Y.
Carborundum Co. The, Niagara Falls, N. Y.
Cortland Grinding Wheels Corp., Chester, Mass.
E. I. DuPont de Nemours & Co., Inc., Tenth & Market Sts., Wilmington 98, Del.
Eisler Engr. Co., 749 S. 13th St., Newark 3
Fibre Abrasive Corp., 1129 East 74th St., Chicago
Macklin Co., Jackson, Mich.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Rix, Inc., 1955 Park Ave., New York City
Sterling Grinding Wheel Co., Tiffin, O.
Walls Sales Corporation, 96 Warren St., New York 7
Weldon Roberts Rubber Co., 351 Sixth Ave., Newark

ACETYLENE, DISSOLVED

Acetylene Gas Company, 3401 Pine Blvd., St. Louis
Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Burdett Oxygen Co., 3300 Lakeside Ave., Cleveland 14
Commercial Gas Corp., 286 Carey Ave., Wilkesbarre, Pa.
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
Liquid Carbonic Corp., Wall Chemicals Div., 3100 S. Kedzie Ave., Chicago 23
National Cylinder Gas Co., 205 W. Wacker, Chicago 7

ALUMINUM ELECTRODES

(See "ELECTRODES, ALUMINUM")

ALUMINUM WELDING ROD

(See "WELDING ROD, ALUMINUM")

ALUMINUM SHEETS AND PLATES

Aluminum Company of America, Gulf Bldg., Pittsburgh
Reynolds Metals Co., Inc., Federal Reserve Bldg., Richmond, Va.

APPLIANCES, SAFETY

American Allsafe Company, Inc., 1245 Niagara Street, Buffalo 13, N. Y.
American Industrial Safety Equipment, Inc., 397 Bridge St., Brooklyn 1
Boyer-Campbell Co., 6540 Antoine St., Detroit
Chicago Hardware Foundry Company, North Chicago, Ill.
Davis Emergency Equip. Co., Inc., 45 Halleck St., Newark 4
Dockson Corporation, 3839 Wabash Ave., Detroit 8
Eastern Equipment Co., Inc., Willow Grove, Pa.
Eastern Safety Clothing Co., 23 W. 60th St., New York City 23
Fibre-Metal Prod. Co., 5th and Tilghman St., Chester, Pa.
General Electric Co., Schenectady 5, N. Y.
General Scientific Equip. Co., 1346 W. Somerset St., Philadelphia 32
Industrial Products Co., 2802 N. 4th St., Philadelphia 33
Jackson Products, 3265 Wight St., Detroit 7
Kimball Safety Prod. Co., 7314 Wade Park Ave., Cleveland 3
McDonald Co., B. F., 1248-M South Hope St., Los Angeles 15
Metro Mfg. Co., 38-11 31st St., Long Island City 1, N. Y.
Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh
Parker Safety Equip. Co., 785 Lyons Av. Irvington, N. J.
Pulmosan Safety Equipment Corp., 176 Johnson St., Brooklyn 1
Sellstrom Mfg. Co., 615 N. Aberdeen St., Chicago
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Welding Engineering Co., 264 E. Ogden, Milwaukee 2
Willson Products, Inc., 2nd and Washington Sts., Reading, Pa.

APPLICATOR BARS

American Manganese Steel Div. of American Brake Shoe Co., 389 E. 14th St., Chicago Heights, Ill.
Marquette Mfg. Co., Inc., 307 E. Hennepin St., Minneapolis 14
Standard Steel & Wire Co., Bolivar, Pa.
Stulz-Sickles Co., 134-42 Lafayette St., Newark 5
Taylor-Wharton Iron & Steel Co., Easton, Pa.

ARC WELDERS, A-C

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Allis-Chalmers Mfg. Co., Milwaukee 1
Borm Mfg. Co., Elgin, Ill.
Eisler Engineering Co., Inc., 749 S. 13th St., Newark 3
Electric Arc., Inc., 152 Jelliff Ave., Newark
Emerson Elec. Mfg. Co., 1824 Washington Ave., St. Louis
Ergolyte Mfg. Co., 3627 N. Lawrence St., Philadelphia 40
General Electric Co., Schenectady 5, N. Y.
Glenn-Roberts Co., 1009 Fruitvale, Oakland, Calif.
Greyhound Elec. Mfg. Co., Inc., 31 Grand St., Brooklyn
Hammett Elec. Mfg. Co., 2558 McGee, Kansas City, Mo.
Hampton Elec. Mfg. Co., Third and Archie St., Oakmont (Pittsburgh)
Harnischfeger Corp., 4400 W. National Ave. Milwaukee 14
Hercules Elec. & Mfg. Co., Inc., 2416 Atlantic, Brooklyn 33
Hi-Lo Mfg. Co., 537 Orleans St., Detroit
Hobart Bros. Co., Troy 1, O.
Larkin Lectro Products Co., 220 Taaffe Pl., Brooklyn 5
K. O. Lee Co., Aberdeen, S. D.
Lincoln Electric Co., 12818 Colt Rd., Cleveland 1
Marquette Mfg. Co., Inc., 307 E. Hennepin St., Minneapolis 14
Mid-States Equip. Co., 2137 S. Wabash Ave., Chicago
Miller Electric Mfg. Co., 14 N. 10th Street, Richmond, Ind.
Miller Elec. Mfg. Co., Inc., 905 N. Meade St., Appleton, Wis.
National Cylinder Gas Co., 205 W. Wacker, Chicago 7
Pier Equip. Mfg. Co., 502 Cross, Benton Harbor, Mich.
Sight Feed Generator Co. 14 N. 10th, Richmond, Ind.
A. O. Smith Corp., 27th and Hopkins, Milwaukee
Smith Welding Equipment Corp., 2633 Fourth St. S. E., Minneapolis 14
Superior Oxy-Acetylene Mach. Co., 1102 High St., Hamilton, O.
Trindl Products Ltd., 17 E. 23rd St., Chicago 16

ARC WELDERS, A-C (Cont.)

Una Welding Inc., 1615 Collamer Ave., Cleveland 10
US Electric Welder Corp., 1224 W. Bancroft St., Toledo 6
Welding Apparatus Company, 2750 W. Van Buren Street, Chicago 12
Western Welder Corp., 212 N. 40th Ave., W., Duluth 7, Minn.
Westinghouse Elec. & Mfg. Co., East Pittsburgh
Will-Weld Mfg. Co., 600 So. 15th St., Omaha, Neb.
Wilson Welder & Metals Co., 60 East 42nd St., New York City 17

ARC WELDERS, ATOMIC-HYDROGEN

Electric Arc, Inc., 152 Jelliff Ave., Newark
General Electric Co., Schenectady 5, N. Y.

ARC WELDERS, AUTOMATIC

Electric Arc, Inc., 152 Jelliff Ave., Newark
General Electric Co., Schenectady 5, N. Y.
Hercules Electric & Mfg. Co., Inc., 2416 Atlantic Ave. Brooklyn
Lincoln Electric Co., 12818 Coit Rd., Cleveland 1
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago 7
A. O. Smith Corp., 27th & Hopkins, Milwaukee
Una Welding, Inc., 1615 Collamer Ave., Cleveland 10
Westinghouse Elec. & Mfg. Co., East Pittsburgh

ARC WELDERS, D-C

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Electric Arc, Inc., 152 Jelliff Ave., Newark
General Electric Co., Schenectady 5, N. Y.
Harnischfeger Corp., 4400 W. National Ave., Milwaukee 14
Hercules Elec. & Mfg. Co., Inc., 2416 Atlantic Ave., Brooklyn 33
Hobart Bros. Co., Troy 1, O.
LeJay Mfg. Co., 2900 Emerson Ave., S., Minneapolis
Libby Welding Co., 2700 East 14th St., Kansas City 1, Mo.
Lincoln Electric Co., 12818 Coit Rd., Cleveland 1
Miller Elec. Mfg. Co., 14 N. 10th Street, Richmond, Ind.
National Cylinder Gas Co., 205 W. Wacker, Chicago 7
F. W. Shrader Co., 5788 Washington, Culver City, Calif.
Sight Feed Generator Co., 14 N. 10th St., Richmond, Ind.
Universal Power Corp., 4899 Euclid, Cleveland 3
Welding Engineering Co., 264 E. Ogden, Milwaukee 2
Westinghouse Elec. & Mfg. Co., E. Pittsburgh
Wilson Welder & Metals Co., 60 East 42nd St., New York City 17

ARC WELDERS, ELECTRONIC, D-C

Air Reduction Sales Co., 60 East 42nd St., New York City 17
Allis-Chalmers Mfg. Co., Milwaukee 1

ASBESTOS

American Optical Co., 16 Mechanic St., Southbridge, Mass.
Foote Mineral Co., 1609 Summer St., Philadelphia 3

AUTOMATIC TIMERS, RESISTANCE WELDING

(See "TIMERS, RESISTANCE WELDING")

BAND SAW WELDERS

Eisler Engineering Co., Inc., 749 S. 13th St., Newark 3
Electric Arc, Inc., 152 Jelliff Ave., Newark
The Federal Machine & Welder Company, 212 Dana St., Warren, O.
Larkin Lectro Products Co., 220 Taaffe Pl., Brooklyn 5
Taylor-Winfield Corp., Warren, O.
Thomson-Gibb Electric Welding Co., 161 Pleasant St., Lynn, Mass.
Weldex, Inc., 7326 McDonald St., Detroit

BENCH WELDERS

Dyer Welder & Engineering Company, 7 East 19th St., Kansas City 8, Mo.
Eisler Engineering Co., Inc., 749 S. 13th St., Newark 3
The Federal Machine & Welder Company, Warren, O.
Larkin Lectro Products Co., 220 Taaffe Place, Brooklyn 5
Thomson-Gibb Electric Welding Co., 161 Pleasant St., Lynn, Mass.
Trindl Products, Ltd., 17 E. 23rd St., Chicago 16

BOOTHS, PORTABLE WELDING

Eisler Engineering Co., Inc., 749 S. 13th St., Newark 3
Ergolyte Mfg. Co., 3627 N. Lawrence St., Philadelphia 40
Kimball Safety Prod. Co., 7314 Wade Park Ave., Cleveland 3
Williams & Co., Inc., 901 Pennsylvania Ave., Pittsburgh

BRACKETS, BOLTS & NUTS, RESISTANCE WELDING

Eisler Engineering Co., Inc., 749 S. 13th St., Newark 3
Ohio Nut & Bolt Co., Front St., Berea, O.

BRASS

American Brass Co, 414 Meadow St., Waterbury 88, Conn.
Chase Brass & Copper Co., Inc., 238 Grand St., Waterbury, Conn.
Revere Copper & Brass, Inc., 230 Park Ave., New York City
Titan Metal Mfg. Co., Bellefonte, Pa.

BRAZING ALLOYS

Alloy Specialties Co., 2441 Waverly Ave., Swissvale 18, Pa.
American Brass Co., 414 Meadow St., Waterbury 88, Conn.
American Solder & Flux Co., 2152 E. Norris St., Philadelphia
Central Steel & Wire Co., 3000 W. 51st St., Chicago 80
Chase Brass & Copper Co., Inc., 238 Grand St., Waterbury, Conn.
Craftsweld Equip. Corp., 2626 Jackson Ave., Long Island City, N. Y.
Eutectic Welding Alloys Co., 40 Worth St., New York City 13
Goldsmith Bros. Smelting & Ref. Co., 58 E. Washington St., Chicago 2
Handy & Harman, 82 Fulton St., New York City 7
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
P. R. Mallory & Co., Inc., 3029 E. Washington St., Indianapolis 6
Modern Engineering Co., Inc., 3401 Pine Blvd., St. Louis
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago 7
Seymour Mfg. Co., 15 Franklin St., Seymour, Conn.
Sherman & Co., 193 Canal St., New York City 13
Special Welding Alloy Co., Inc., 27-33 Jackson, Long Island City, N. Y.
Steel Sales Corp., 3348 S. Pulaski Road, Chicago 23
Titan Metal Mfg. Co., Bellefonte, Pa.
Universal Power Corp., 4899 Euclid Ave., Cleveland 3
Weldaloy Mfg. Co., 421 Canal St., New York City
Westinghouse Elec. & Mfg. Co., E. Pittsburgh

BRAZING ALLOYS, ALUMINUM

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Aladdin Rod & Flux Mfg. Co., Box 935, Madison Sq. Sta., Grand Rapids 7, Mich.
Aluminum Company of America, Gulf Bldg., Pittsburgh
Central Steel & Wire Co. 3000 W. 51st St., Chicago 80
Eutectic Welding Alloys Co., 40 Worth St., New York City 13
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
Modern Engineering Co., 3401 Pine Blvd., St. Louis
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago 7
Sherman & Co., 193 Canal St., New York City 13
Special Welding Alloy Co., Inc., 27-33 Jackson, Long Island City, N. Y.
Steel Sales Corp., 3348 S. Pulaski, Chicago 23
Weldaloy Mfg. Co., 421 Canal St., New York City

BRAZING ALLOYS, FURNACE

Chase Brass & Copper Co., Inc., 238 Grand St., Waterbury, Conn.
Eutectic Welding Alloys Co., 40 Worth St., New York City 13
Steel Sales Corp., 3348 S. Pulaski, Chicago 23

BRAZING OUTFITS, ELECTRIC

Acro Welder Mfg. Co., Inc., 1825 W. St. Paul Ave., Milwaukee
Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Ajax Electrothermic Corp., Ajax Park, Trenton 5, N. J.
American Electric Fusion Corp., 2600 Diversey Ave., Chicago 47
Ergolyte Mfg. Co., 3627 N. Lawrence St., Philadelphia 40
General Electric Co., Schenectady 5, N. Y.
Ideal Commutator Dresser Co., 1935 Park Ave., Sycamore, Ill.
Marquette Mfg. Co., Inc., 307 E. Hennepin St., Minneapolis 14
Modern Engineering Co., 3401 Pine Blvd., St. Louis
National Elec. Welding Mach. Co., 1846 N. Trumbull St., Bay City, Mich.
Thomson-Gibb Electric Welding Co., 161 Pleasant St., Lynn, Mass.
Trindl Products, Ltd., 17 E. 23rd St., Chicago 16
Westinghouse Elec. & Mfg. Co., E. Pittsburgh

BRAZING OUTFITS, GAS

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Bastian-Blessing Co., 4201 Peterson Ave., Chicago 30
Craftsweld Equip. Corp., 2626 Jackson Ave., Long Island City, N. Y.
Dockson Corporation, 3839 Wabash Ave., Detroit 8
General Welding & Equip. Co., 268 Northampton St., Boston 18
Harris Calorific Co., 5501 Cass Ave., Cleveland 2
Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
Liquid Carbonic Corp., Wall Chemicals Div., 3100 S. Kedzie Ave., Chicago 23
Alexander Milburn Co., 1416 W. Baltimore St., Baltimore 23
Modern Engineering Co., Inc., 3401 Pine Blvd., St. Louis
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago 7
Rail Supply Co., 110 E. 42nd Street, New York City 17
Smith Welding Equipment Corp., 2633 Fourth Street, S. E., Minneapolis 14
Superior Oxy-Acetylene Mach. Co., 1102 High St., Hamilton, O.
Torit Mfg. Co., 270 Walnut St., St. Paul
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Welders Supply & Mfg. Co., 108 W. Central Parkway, Cincinnati
Weldit Acetylene Co., 636 Bagley, Detroit 26

BRAZING OUTFITS, INCANDESCENT CARBON

Acro Welder Mfg. Co., Inc., 1825 W. St. Paul Ave., Milwaukee
General Electric Co, Schenectady 5, N. Y.

BRONZE

American Brass Co., 414 Meadow St., Waterbury, 88, Conn.
Ampco Metal, Inc., 1745 S. 38th St., Milwaukee 4
Burdett Oxygen Co., 3300 Lakeside Ave., Cleveland 14
Central Steel & Wire Co., 3000 W. 51st St., Chicago 80
Chase Brass & Copper Co., Inc., 238 Grand St., Waterbury, Conn.
Craftsweld Equipment Corp., 2626 Jackson Ave., Long Island City 1, N. Y.
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago 7
Revere Copper & Brass, Inc., 220 Park Ave., New York City
Steel Sales Corp., 3348 S. Pulaski, Chicago 23
Titan Metal Mfg. Co., Bellefonte, Pa.

BRUSHES (MOTOR AND GENERATOR)

Becker Bros. Carbon Co., 3450 S. 52nd Ave., Cicero 50, Ill.
Burdett Oxygen Co., 3300 Lakeside Ave., Cleveland 14
Joseph Dixon Crucible Co., 167 Wayne St., Jersey City 3
General Electric Co., Schenectady 5, N. Y.
Hobart Bros. Co., Troy 1, O.
Lincoln Electric Co., 12818 Coit Rd., Cleveland 1
National Carbon Co., Inc., Madison & W. 117th, Cleveland 1
Ohio Carbon Co., 12508 Berea Rd., Cleveland
Speer Carbon Co., St. Marys, Pa.
Stackpole Carbon Co., St. Marys, Pa.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh

BRUSHES, ROTARY WIRE

Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland

BUTT WELDERS, RESISTANCE

Agnew Electric Company, Milford, Mich.
Acme Electric Welder Co., 2618 Fruitland Rd., Los Angeles
E. D. Caddington Mfg. Co., 5024 N. 37th St., Milwaukee 9
Dyer Welder & Engineering Co., 7 East 19th Street, Kansas City 8, Mo.
Eisler Engineering Co., Inc., 749 S. 13th., Newark 3
Electric Arc, Inc., 152 Jelliff Ave., Newark
Federal Mach. & Welder Co., 212 Dana St., Warren, Ohio
Larkin Lectro Products Co., 220 Taaffe Place, Brooklyn 5
Micro Products Co., 20 N. Wacker Drive Chicago 6
National Elec. Welding Mach. Co., 1846 N. Trumbull St., Bay City, Mich.
Pier Equip. Mfg. Co., 502 Cross, Benton Harbor, Mich.
Progressive Welder Co., 3050 E. Outer Drive, Detroit 12
Sciaky Bros., 4915 W. 67th St., Chicago 38
Taylor-Winfield Corp., Warren, O.
Thomson-Gibb Electric Welding Co., 161 Pleasant St., Lynn, Mass.
Universal Power Corp. 4899 Euclid, Cleveland 3
Welding Machines Mfg. Co., 17325 Lamont Ave., Detroit 12

CABLE, ARC-WELDING

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
American Steel & Wire Company, 614 Superior St., N. W., Cleveland 13, O.
Anaconda Wire & Cable Co., 25 Broadway, New York City 4
Belden Mfg. Co., 4647 W. Van Buren St., Chicago 44
Burdett Oxygen Co., 3300 Lakeside Ave., Cleveland 14
Eastern Equipment Co., Inc., Willow Grove, Pa.
General Electric Co., Schenectady 5, N. Y.
Hobart Bros. Co., Troy 1, O.

CABLE, ARC WELDING (Cont.)

Larkin Lectro Products Co., 220 Taaffe Place, Brooklyn 5
Lincoln Electric Co., 12818 Coit Rd., Cleveland 1
Marquette Mfg. Co., Inc., 307 E. Hennepin St., Minneapolis 14
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago 7
Okonite Co., Passaic, N. J.
Rome Cable Corp, Rome, N. Y.
Superior Oxy-Acetylene Mach. Co., 1102 High St., Hamilton, O.
Trindl Products Ltd., 17 E. 23rd St., Chicago 16
Welding Engineering Co., 264 E. Ogden, Milwaukee 2
Westinghouse Elec., & Mfg. Co., E. Pittsburgh
Wilson Welder & Metals Co. Inc., 60 East 42nd St., New York City 17

CABLE, RESISTANCE WELDING

American Electric Fusion Corp., 2600 Diversey Ave., Chicago 47
American Steel & Wire Company, 614 Superior St., N. W., Cleveland 13
General Electric Co., Schenectady 5, N. Y.
Larkin Lectro Products Co., 220 Taaffee Pl., Brooklyn 5
Okonite Co., Passaic, N. J.
Progressive Welder Co., 3050 E. Outer Dr., Detroit 12
Universal Power Corp., 4899 Euclid, Cleveland 3
Welding Machines Mfg. Co., 17325 Lamont Ave., Detroit

CARBIDE

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
American Carbide & Chem. Co., Arkansas City, Kans.
Independent Engineering Company, O'Fallon, Ill.
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
National Carbide Corp., 60 E. 42nd St., New York City 17
National Cylinder Gas Co., 205 W. Wacker, Chicago 7
Shawinigan Products Corp., Empire State Bldg., New York City 1

CARBON (BLOCKS, PASTE, ELECTRODES)

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Becker Bros. Carbon Co., 3450 S. 52nd Ave., Cicero 50, Ill.
Burdett Oxygen Co., 3300 Lakeside Ave., Cleveland 14
Central Steel & Wire Co., 3000 W. 51st St., Chicago 80
Joseph Dixon Crucible Co., 167 Wayne St., Jersey City 3
Great Lakes Carbon Co., 910 S. Michigan Ave., Chicago 5
National Carbon Co., Inc., Madison & W. 117th, Cleveland 1
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago 7
Ohio Carbon, 12508 Berea Rd., Cleveland
Speer Carbon Co., St. Marys, Pa.
Stackpole Carbon Co., St. Marys, Pa.
Steel Sales Corp., 3348 S. Pulaski, Chicago 23

CAST IRON ELECTRODES

(See "ELECTRODES, CAST IRON")

CAST IRON WELDING ROD

(See "WELDING ROD, CAST IRON")

CEMENT, WELDING

Wesley Lacquer Co., 95 Fourth St., Brooklyn 31

CHISELS

Atlas Welding Accessories Co., 14824 Wyoming Ave., Detroit 21
Bethlehem Steel Co., 701 E. Third St., Bethlehem, Pa.
Bonney Forge & Tool Works, Tilghman Street, Allentown, Pa.
Cincinnati Tool Company, 1951 Waverly Ave., Norwood 12, Ohio
Dallett Co., The, Mascher at Lippincott St., Philadelphia 33
St. Pierre Chain Corp., Frank St., Worcester 49, Mass.
U. S. Steel Supply Co., 1319 Wabansia Ave., Chicago 90
Williams & Co., J. H., 400 Vulcan St., Buffalo 7

CLAMPS, GROUND

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Albert & J. M. Anderson Mfg Co., 289 A St., Boston 10
Armstrong Bros. Tool Co., 317 N. Francisco, Chicago
Burndy Engrg. Co., 107 Eastern Blvd., New York City 54
Cincinnati Tool Co., Waverly Ave., Norwood 12, Ohio
General Electric Co., Schenectady 5, N. Y.
Grand Specialties Co., 3101 W. Grand Ave., Chicago
Hercules Electric & Mfg. Co., Inc., 2416 Atlantic Ave., Brooklyn 33
Hobart Brothers Co., Troy 1, O.
Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chicago 6
K. O. Lee Co., Aberdeen, S. D.
Lincoln Electric Co., 12818 Coit Rd., Cleveland 1
Marquette Mfg. Co., Inc., 307 E. Hennepin St., Minneapolis 14.
Michigan Clamp Co., Box 243, Jackson, Mich.
Mueller Elec. Co., 1583 E. 31st, Cleveland 14
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago 7
Steel Sales Corp., 3348 S. Pulaski Rd., Chicago 23
Trindl Products Ltd., 17 E. 23rd St., Chicago 16
Tweco Prod. Co., English at Ida, Wichita 7, Kans.
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Westinghouse Electric and Mfg. Co., East Pittsburgh, Pa.
Williams & Co., Inc., 901 Pennsylvania Ave., Pittsburgh

CLAMPS, TOGGLE

Cincinnati Tool Co., 1951 Waverly Ave., Cincinnati 12
Danley Mach. Specialties Co., Inc., 2130 S. 52nd Ave., Chicago
Detroit Stamping Co., 350 Midland Ave., Detroit 3
Grand Specialties Co., 3101 W. Grand Ave., Chicago
Knu-Vise, Inc., 1336 Plum St., Detroit 16

CLAMPS, WELDING

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Albert & J. M. Anderson Mfg. Co., 289 A St., Boston 10
Adjustable Clamp Co., 426 N. Ashland Ave., Chicago
Armstrong Bros. Tool Co., 317 N. Francisco, Chicago
Chicago Boiler Company, 1965 Clybourn Ave., Chicago 14
Cincinnati Tool Co., 1951 Waverly Ave., Cincinnati 12
Detroit Stamping Co., 350 Midland Ave., Detroit 3
General Electric Co., Schenectady 5, N. Y.
Grand Specialties Co., 3101 W. Grand Ave., Chicago
Hercules Electric & Mfg Co., Inc., 2416 Atlantic, Brooklyn 33
Jewel Mfg. Co., 1841 University Ave., St. Paul 4
Knu-Vise, Inc., 1336 Plum St., Detroit 16
Linde Air Products Co., The, 30 E. 42nd St. New York City 17
Michigan Clamp Co., Jackson, Mich.
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago 7
Templeton, Kenly & Company, 1020 S. Central Ave., Chicago
Tweco Products Co., English at Ida, Wichita 7, Kans.
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Williams & Co., J. H., 400 Vulcan St., Buffalo 7

CLAMPS, WELDING MAGNETIC

Glenn-Roberts Co., 1009 Fruitvale, Oakland, Calif.
Hercules Electric & Mfg. Co., Inc., 2416 Atlantic Ave., Brooklyn 33
F. W. Shrader Co., 5788 Washington, Culver City, Calif.

CLAMPS, WELDING VACUUM

Glenn-Roberts Co., 1009 Fruitvale, Oakland, Calif.

CLEANERS, METAL

Atlas Welding Accessories Company, 14824 Wyoming Ave., Detroit 21
Cowles Detergent Co., 7016 Euclid Ave., Cleveland 3
Diversey Corp., 53 W. Jackson St., Chicago 4
E. I. du Pont de Nemours & Co., Inc., Tenth & Market St., Wilmington 98
J. B. Ford, Wyandott, Mich.
Frederick Gumm Chemical Co., Inc., 538 Forest St., Kearny, N. J.
NuSteel Co., 1714 Ashland Ave., Chicago 8
Oakite Products, Inc., 18 E. Thames, New York City 6
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia 7
Philadelphia Quartz Co., 125 S. 3rd St., Philadelphia 6
Weldon Roberts Rubber Co., 351 Sixth Ave., Newark
Special Chemicals Co., 30 Irving Pl., New York City

CLEANING TOOLS

(See "TOOLS, WELDORS")

CLOTHING, SAFETY

American Allsafe Company, Inc., 1245 Niagara Street, Buffalo 13, N. Y.
American Optical Co., 16 Mechanic St., Southbridge, Mass.
Armstrong Supply Co., 1618 No. Broad St., Philadelphia 21
Asbestos Fibre Spinning Co., North Wales, Pa.
B. & H. Welders Supplies, 403 Fourth St., Portsmouth, Va.
Boston Athletic Shoe Co., Cambridge 41, Mass.
Boyer-Campbell Co., 6540 Antoine St., Detroit
Eastern Equipment Co., Inc., Willow Grove, Pa.
Eastern Safety Clothing Co., 23 W. 60th St., New York City 23
Ergolyte Mfg. Co., 3627 N. Lawrence St., Philadelphia 40
General Electric Co., Schenectady 5, N. Y.
General Scientific Equip. Co., 1346 W. Somerset St., Philadelphia
Hanover Glove Co., Hanover, Pa.
Holcomb Safety Garment Co., 120 N. Jefferson St., Chicago
Industrial Gloves Co., Danville, Ill.
Industrial Prod. Co., 2820 N. 4th St., Philadelphia 33
Jackson Products, 3625 Wight St., Detroit 7
Fred Jessar, 404 Denckla Bldg., Philadelphia 7
Kimball Safety Prod. Co., 7314 Wade Park Ave., Cleveland 3
Larkin Lectro Products Co., 220 Taaffe Pl., Brooklyn 5
Lincoln Electric Co., 12818 Coit Rd., Cleveland 1
Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago 7
Parker Safety Equip. Corp., 785 Lyons Ave., Irvington, N. J.
Pulmosan Safety Equipment Corp., 176 Johnson St., Brooklyn 1, N. Y.
Rail Supply Co., 110 E. 42nd St., New York City 17
Safety Clothing & Equip. Co., 7016 Euclid Ave., Cleveland
S. C. Leather Co., 819 Fifth Ave., Pittsburgh 19
Sellstrom Mfg. Co., 605 Aberdeen St., Chicago 22
Singer Leather Clothing Co., 129 No. 12th St., Philadelphia
Standard Safety Equip. Co., 232 W. Ontario St., Chicago 10
Steel Sales Corp., 3348 S. Pulaski, Chicago 23
Superior Oxy-Acetylene Mach. Co., 1102 High St., Hamilton, O.
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Westinghouse Elec. & Mfg. Co., East Pittsburgh
Willson Products, Inc., 2nd & Washington Sts., Reading, Pa.

CLOTHING, WOMEN'S SAFETY

American Allsafe Company, Inc., 1245 Niagara St., Buffalo 12, N. Y.
American Optical Co., 16 Mechanic St., Southbridge, Mass.
Armstrong Supply Co., 1618 No. Broad St., Philadelphia 21
B & H Welders Supplies, 403 Fourth St., Portsmouth, Va.
Boston Athletic Shoe Co., Cambridge 41, Mass.
Boyer-Campbell Co., 6540 Antoine St., Detroit
Davis Emergency Equip. Co., Inc., 45 Halleck St., Newark 4
Eastern Equipment Co., Inc., Willow Grove, Pa.
Eastern Safety Clothing Co., 23 W. 60th St., New York City 23
Ergolyte Mfg. Co., 3627 N. Lawrence St., Philadelphia 40
General Electric Co., Schenectady 5, N. Y.
Holcomb Safety Garment Co., 120 N. Jefferson St., Chicago
Industrial Gloves Co., Danville, Ill.
Industrial Prod. Co., 1820 N. 4th St., Philadelphia 33
Fred Jessar, 404 Denckla Bldg., Philadelphia 7
Kimball Safety Prod. Co., 7314 Wade Park Ave., Cleveland 3
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago 7
Pulmosan Safety Equipment Corp., 176 Johnson St., Brooklyn 1, N. Y.
Rail Supply Co., 110 E. 42nd St., New York City 17
S. C. Leather Co., 819 Fifth Ave., Pittsburgh 19
Safety Clothing & Equip Co., 7016 Euclid, Cleveland
Sellstrom Mfg. Co., 615 N. Aberdeen St., Chicago 22
Singer Leather Clothing Co., 129 No. 12th St., Philadelphia
Standard Safety Equipment Co., 232 W. Ontario St., Chicago 10
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Willson Products, Inc., 2nd and Washington Sts., Reading, Pa.

COATING MATERIALS, ELECTRODE

American Agile Corp., 5806 Hough Ave., Cleveland
American Manganese Steel Div., 389 E. 14th St., Chicago Heights, Ill.
Aufhauser Brothers Co., 295 Madison Ave, New York City
E. I. DuPont de Nemours & Co., Wilmington, Del.
Foote Mineral Company, 1609 Summer St., Philadelphia 3
Philadelphia Quartz Co., 125 S. 3rd, Philadelphia 6
The Titanium Alloy Mfg. Co., Hyde Park Blvd., Niagara Falls, N. Y.
Titanium Pigment Corporation, 111 Broadway, New York City 6

COILS, PREHEATING, ANNEALING & STRESS RELIEVING

Ajax Electrothermic Corp., Ajax Park, Trenton 5
Electric Arc., Inc., 152 Jelliff Ave., Newark
Falcon Equipment Company (successors to H. O. Swoboda, Inc.) 13th St., New Brighton, Pa.
Hercules Electric & Mfg. Co., Inc., 2416 Atlantic, Brooklyn 33
Rubicon Co., Ridge Ave., at 35th St. Philadelphia
Sciaky Bros., 4915 W. 67th St., Chicago 38
F. W. Shrader, 5788 Washington, Culver City, Calif.

CONNECTORS, CABLE

Albert & J. M. Anderson Mfg. Co., 289 A. St., Boston 10
Burndy Engineering Co., Inc., 107 Eastern Blvd., New York City 54
Chicago Tool & Engineering Co., 8383 So. Chicago Ave., Chicago 17

CONNECTORS, CABLE (Cont.)

Craftsweld Equipment Corp., 2626 Jackson Ave., Long Island City 1, N. Y.
Dallett Co., The, Mascher at Lippincott St., Philadelphia 33
Fibre Metal Products Co., The, 5th & Tilghman Streets, Chester, Pa.
General Electric Co., Schenectady 5, N. Y.
Howard B. Jones, 2460 W. George St., Chicago 18.
K. O. Lee Co., Congress & 1st Ave., Aberdeen, S. D.
Lincoln Electric Co., 12818 Coit Rd., Cleveland 1
Marquette Mfg. Co., Inc., 307 E. Hennepin St., Minneapolis 14
Miller Electric Mfg. Co., 14 N. 10th Street, Richmond, Ind.
Modern Engineering Co., Inc., 3401 Pine Blvd., St. Louis
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago 7
Rail Supply Co., 110 E. 42nd St., New York City 17
Russell & Stoll Company, 125 Barclay, New York City 7
Thermex Equipment Co., 2045 Celia St., Detroit 8
Tweco Prod. Co., English at Ida, Wichita, Kan.
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Westinghouse Electric and Mfg. Co., East Pittsburgh Pa.
Will-Weld Mfg. Co., 1501 Jackson, Omaha, Nebr.

CONTROLS, RESISTANCE WELDING

Agnew Electric Company, Milford, Mich.
American Elec. Fusion Corp., 2600 Diversey Ave., Chicago 47
Clark Controller Co., 1146 E. 152nd St., Cleveland
Cutler-Hammer, Inc., 315 N. 12th St., Milwaukee 1
Dyer Welder & Engineering Company, 7 E. 19th St., Kansas City 8, Mo.
Electric Controller & Mfg Co., 2700 E. 79th St., Cleveland 4
General Electric Co., Schenectady 5, N. Y.
National Time & Signal Corp., 603 E. Milwaukee, Detroit
Ohmite Manufacturing Co., 4835 W. Flournoy St., Chicago 44
Pier Equip. Mfg. Co., 502 Cross, Benton Harbor, Mich.
Sciaky Bros., 4915 W. 67th St., Chicago 38
Square D Co., 4041 N. Richards, Milwaukee 12
Weltronic Co., 3080 E. Outer Drive, Detroit, Mich.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh

CONVERSION UNITS, A-C ARC

A-C Devices Co., 3020 S. Michigan Ave., Chicago
Electric Arc, Inc., 152 Jelliff Ave., Newark
Ergolyte Mfg. Co., 3627 N. Lawrence St., Philadelphia 40
Mid-States Equip. Co., 2137 S. Wabash Ave., Chicago
Welding Apparatus Company, 2750 Van Buren St., Chicago 12
Westinghouse Electric and Mfg. Co., East Pittsburgh Pa.

COPPER

American Brass Co., 414 Meadow St., Waterbury, Conn.
Central Steel & Wire Co., 3000 W. 51st St., Chicago 80
Chase Brass & Copper Co., Inc., 238 Grand St., Waterbury, Conn.
Eutectic Welding Alloys Co., 40 Worth St., New York City 13
Revere Copper & Brass, Inc., 230 Park Ave., New York City
Steel Sales Corp., 3348 S. Pulaski, Chicago 23

CRATER ELIMINATORS, ARC

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Allis-Chalmers Mfg. Co., Milwaukee 1
Atlas Welding Accessories Company, 14824 Wyoming Ave., Detroit 21
Electric Arc, Inc., 152 Jelliff Ave., Newark
General Electric Co., Schenectady 5, N. Y.
Lincoln Electric Co., 12818 Coit Rd., Cleveland 1
Carl Strobel Corp., 4700 Santa Fe, Los Angeles
Wilson Welder & Metals Co., 60 East 42nd St., New York City 17

CURTAINS, WELDING

Boyer-Campbell Co., 6540 Antoine St., Detroit
Daniels, Inc., C. R., 44 West St., New York City
Eastern Equipment Co., Inc., Willow Grove, Pa.
Eastern Welding Equipment Co., 17 W. 60th St., New York City 23
Ergolyte Mfg. Co., 3627 N. Lawrence St., Philadelphia 40
General Electric Co., Schenectady 5, N. Y.
Industrial Gloves Co., 201 Garfield Blvd., Danville, Ill.
Industrial Prod. Co., 2820 N. 4th St., Philadelphia 33
Fred Jessar, 404 Denckla Bldg., Philadelphia 7
Kimball Safety Prod. Co., 7314 Wade Park Ave., Cleveland 3
Parker Safety Equipment Co., 785 Lyons St., Irvington, N. J.
Pulmosan Safety Equipment Corp., 176 Johnson St., Brooklyn 1
Rail Supply Co., 110 E. 42nd St., New York City 17
Safety Clothing & Equip. Co., 7016 Euclid, Cleveland
Victor Equipment Co., 844-54 Folsom St., San Francisco 7

CUTTING MACHINES, GAS

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Burdett Oxygen Co., 3300 Lakeside Ave., Cleveland 14
Dockson Corporation, 3839 Wabash Ave., Detroit 8
Gaso Equipment Co., 2532 Irving Park, Chicago
General Welding & Equip. Co., 268 Northampton St., Boston 18
Harris Calorific Co., 5501 Cass Ave., Cleveland 2
Hayes Track Appliance Co., Richmond, Ind.
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
Liquid Carbonic Corp., Wall Chemicals Div., 3100 S. Kedzie Ave., Chicago 23
Alexander Milburn Co., 1416 W. Baltimore St., Baltimore 23
Modern Engineering Co., Inc., 3401 Pine Blvd., St. Louis, Mo.
National Cylinder Gas Co., 205 W. Wacker, Chicago 7
Rail Supply Co., 110 E. 42nd St., New York City 17
Schraeder-Bowers Co., 2629 Lincoln Way W., Mishawaka, Ind.
Scholtz Engineering Works, Waterloo, Ia.
Stanley Electric Tool Div., 177 Elm St., New Britain, Conn.
Stow Mfg. Co., 443 State St., Binghamton, N. Y.
Superior Oxy-Acetylene Mach. Co., 1102 High St., Hamilton, O.
Victor Equipment Co., 844-54 Folsom St., San Francisco 7

CUTTING TORCHES, GAS

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Bastian-Blessing Co., 4201 Peterson Ave., Chicago 30
Burdett Oxygen Co., 3300 Lakeside Ave., Cleveland 6
Craftsweld Equip. Corp., 2626 Jackson Ave., Long Island City, N. Y.
Eastern Welding Equipment Co., 17 W. 60th St. New York City 23
General Welding & Equipment Co., 268 Northampton St., Boston 18
Harris Calorific Co., 5501 Cass Ave., Cleveland 2
Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago
K-G Welding & Cutting Co., Inc., 515 W. 29th St., New York City
Linde Air Prod. Co., 30 E. 42nd St., New York City 17
Liquid Carbonic Corp., Wall Chemicals Div., 3100 S. Kedzie Ave., Chicago 23
Metro Mfg. Co., 38-11 31st St., Long Island City 1, N. Y.
Alexander Milburn Co., 1416 W. Baltimore St., Baltimore 23
Modern Engineering Co., Inc., 3401 Pine Blvd., St. Louis, Mo.
J. Nageldinger & Son, Inc., 409 East 91st St., New York City 28
National Cylinder Gas Co., 205 W. Wacker, Chicago 7
Rail Supply Co., 110 E. 42nd St., New York City 17
Smith Welding Equipment Corp., 2633 Fourth Street, S.E., Minneapolis 14
Superior Oxy-Acetylene Mach. Co., 1102 High St., Hamilton, O.
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Weldit Acetylene Co., 636 Bagley, Detroit 26

CUTTING TORCHES, UNDERWATER

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Bastian-Blessing Co., The, 4201 Peterson Ave., Chicago 30
Chicago Tool and Engineering Co., 8383 South Chicago Ave., Chicago 17
Craftsweld Equip. Corp., 2626 Jackson Ave., Long Island City, N. Y.
Electric Arc, Inc., 152 Jelliff Ave., Newark
Harris Calorific Co., 5501 Cass Ave., Cleveland 2
Modern Engineering Co., Inc., 3401 Pine Blvd., St. Louis, Mo.
National Cylinder Gas Co., 205 W. Wacker, Chicago 7
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Weldit Acetylene Co., 636 Bagley, Detroit 26

CYLINDERS, ACETYLENE

Independent Engineering Co., 117 W. Second St., O'Fallon, Ill.
Linde Air Products Co., The, 30 E. 42nd Street, New York 17
Alexander Milburn Co., 1416 W. Baltimore St., Baltimore 23
Modern Engineering Co., Inc., 3401 Pine Blvd., St. Louis, Mo.
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago 7
Pressed Steel Tank Co., 1445 S. 66th St., Milwaukee
Taylor Cylinder Div., Cuneo Press, 2262 S. Grove St., Chicago

CYLINDERS, OXYGEN

Harrisburg Steel Corp., Harrisburg, Pa.
Independent Engineering Co., 117 W. Second St., O'Fallon, Ill.
Alexander Milburn Co., 1416 W. Baltimore St., Baltimore 23
Modern Engineering Co., Inc., 3401 Pine Blvd., St. Louis, Mo.
Pressed Steel Tank Co., 1445 S. 66th St., Milwaukee
Taylor-Wharton Iron & Steel Co., Easton, Pa.

CYLINDER TRUCKS

(See "TRUCKS, CYLINDER")

DIES, RESISTANCE WELDING

Agnew Electric Co., Milford, Mich.
Acme Electric Welder Co., 2618 Fruitland Rd., Los Angeles
American Electric Fusion Corp., 2600 Diversey Ave., Chicago 47
Dyer Welder & Engineering Co., 7 East 19th Street, Kansas City 8, Mo.
Electroloy Co., Inc., 1600 Seaview Ave., Bridgeport, Conn.
The Federal Machine & Welder Co., 212 Dana Street, Warren, O.
P. R. Mallory & Co., Inc., 3029 E. Washington, Indianapolis 6
National Elec. Welding Mach. Co., 1846 N. Trumbull St., Bay City, Mich.
Pier Equip. Mfg. Co., 502 Cross, Benton Harbor, Mich.
Progressive Welder Co., 3050 E. Outer Drive, Detroit 12
S-M-S Corp., 1165 Harper Ave., Detroit 11
Taylor-Winfield Corp., Warren, O.
Thomson-Gibb Electric Welding Co., 161 Pleasant, Lynn, Mass.
Universal Power Corp., 4899 Euclid Ave., Cleveland 3
Welding Machines Mfg. Co., 17325 Lamont Ave., Detroit 12
Welding Sales & Engineering Co., 8750 Grinnell St., Detroit 13

DRILLS, PORTABLE ELECTRIC

Black & Decker Mfg. Co., The, Towson 4, Md.
Independent Pneum. Tool Co., 600 W. Jackson Blvd., Chicago 6
Mall Tool Company, 7740 South Chicago Ave., Chicago 19
Chas. F. Overly Co., 1753 Rosedale Ave., Cleveland 12, O.
Joseph T. Ryerson & Son Inc., 2558 W. 16th St., Chicago
Skilsaw, Inc., 4763 Winnemac Ave., Chicago 30
Stanley Elec. Tool Div., 177 Elm St., New Britain, Conn.
Stow Mfg. Co., 443 State St., Binghamton, N. Y.

DRILLS, PORTABLE FLEXIBLE SHAFT

Cleveland Pneum. Tool Co., 3781 E. 77th St., Cleveland
Mall Tool Company, 7740 South Chicago Ave., Chicago 19
Skilsaw, Inc., 4763 Winnemac Ave., Chicago 30
Stow Mfg. Co., 443 State St., Binghamton, N. Y.

DRILLS, TORCH TIP CLEANING

Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago
Metro Mfg. Co., 38-11 31st St., Long Island City 1, N. Y.
Alexander Milburn Co., The, 1416 W. Baltimore St., Baltimore 23

DUST COLLECTORS

(See "VENTILATING APPARATUS")

EAR PROTECTORS, WELDORS

Eastern Equipment Co., Inc., Willow Grove, Pa.
General Scientific Equip. Co., 1346 W. Somerset St., Philadelphia 32
Kimball Safety Prod. Co., 7314 Wade Park Ave., Cleveland 3
Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh
Safety Clothing & Equipment Co., 7016 Euclid, Cleveland
Willson Products, Inc., 2nd and Washington Sts., Reading, Pa.

ELECTRODE CARRIERS

Atlas Welding Accessories Co., 14824 Wyoming Ave., Detroit 21
B & H Welders Supplies, 403 Fourth St., Portsmouth, Va.
Eastern Safety Clothing Co., 23 W. 60th St., New York City 23
Ergolyte Mfg. Co., 3627 N. Lawrence St., Philadelphia 40
Fibre-Metal Prod. Co., 5th and Tilghman St., Chester, Pa.
General Electric Co., Schenectady 5, N. Y.
Industrial Prod. Co., 2820 N. 4th St., Philadelphia 33
Fred Jessar, 404 Denckla Bldg., Philadelphia 7
Kimball Safety Prod. Co., 7314 Wade Park Ave., Cleveland 3
S. C. Leather Co., 819 Fifth Ave., Pittsburgh 19
Safety Clothing & Equip. Co., 7016 Euclid, Cleveland
Singer Leather Clothing Co., 129 No. 12th St., Philadelphia
Universal Power Corp., 4899 Euclid Ave., Cleveland 3
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Welding Engineering Co., 264 E. Ogden, Milwaukee 2
Williams & Co., Inc., 901 Pennsylvania Ave., Pittsburgh

ELECTRODE COATING MATERIALS

(See "COATING MATERIALS, ELECTRODE")

ELECTRODE HOLDERS

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Albert & J. M. Anderson Mfg. Co., 289 A Street, Boston 10
Chicago Tool & Engineering Co., 8383 South Chicago Ave., Chicago 17
Churchward Engineering Co., 103 Sperry St., New Haven, Conn.
Craftweld Equip. Corp., 2626 Jackson Ave., Long Island City, N. Y.
Detroit Electrode Holder Co., 3443 Book Bldg., Detroit
Dockson Corp., 3839 Wabash, Detroit 8
Eastern Safety Clothing Co., 23 W 60th St., New York City 23
Eastern Welding Equipment Co., 17 W. 60th St., New York City 23
Eisler Engineering Co., 749 S. 13th St., Newark 3
Electric Arc, Inc., 152 Jelliff Ave., Newark
Ergolyte Mfg. Co., 3627 N. Lawrence St., Philadelphia 40
F. R. Faulk, 405 Penn. Ave., Pittsburgh 22
Fibre-Metal Prod. Co., The, 5th and Highman St., Chester, Pa.
Franklin Transformer Mfg. Co., 65 22nd Ave. N.E., Minneapolis 13
Gem Electrode Holder Co., 1133 Broadway, New York City 10
General Electric Co., Schenectady 5, N. Y.
General Scientific Equip. Co., 1346 W. Somerset St., Philadelphia
Hammett Elec. Mfg. Co., 209 W. 19th Terrace, Kansas City, Mo.
Hobart Bros. Co., Troy 1, O.
Industrial Prod. Co., 2820 N. 4th St., Philadelphia
Jackson Products, 3625 Wight St., Detroit 7
Kimball Safety Prod. Co., 7314 Wade Park Ave., Cleveland
Larkin Lectro Prod. Co., 220 Taaffe Pl., Brooklyn 5
K. O. Lee Co., Aberdeen, S. D.
Lincoln Electric Co., 12818 Coit Rd., Cleveland 1
P. R. Mallory & Co., Inc., 3029 E. Washington, Indianapolis 6
Marquette Mfg. Co., 307 E. Hennepin St., Minneapolis 14
Metal Bond Mfg. Co., 3201 Kossuth Ave., St. Louis 7
Metro Mfg. Co., 38-31 31st St., Long Island City 1, N. Y.
Miller Electric Mfg. Co., 14 N. 10th St., Richmond, Ind.
Miller Elec. Mfg. Co., Inc., 905 N. Meade St., Appleton, Wis.
Modern Engineering Co., Inc., 3401 Pine Blvd., St. Louis
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago 7
Parker Safety Equip. Co., 785 Lyons Ave., Irvington, N. J.
Pulmosan Safety Equipment Co., 176 Johnson St., Brooklyn 1
Rail Supply Co., 110 E. 42nd St., New York City 17
Rasmussen Iron Works, 308 West Philadelphia St., Whittier, Calif.
Special Welding Alloy Co., Inc., 27-33 Jackson, Long Island City, N. Y.
Steel Sales Corp., 3348 S. Pulaski, Chicago 23
Stoody Co., 1135 W. Slauson Ave., Whittier, Calif.
Superior Oxy-Acetylene Mach. Co., 1102 High St., Hamilton, O.
Thermex Equipment Co., 2045 Calla St., Detroit 8
Trindl Products Ltd., 17 E. 23rd St., Chicago 16
Tweco Products Co., English at Ida, Wichita 7, Kans.
US Electric Welder Corp., 1224 Bancroft St., Toledo 6, O.
Martin Wells, 5886 Compton Ave., Los Angeles 1
Westinghouse Elec. & Mfg. Co., E. Pittsburgh
Will-Weld Mfg. Co., 1501 Jackson, Omaha, Neb.
Wilson Welder & Metals Co. Inc., 60 East 42nd St., New York City 17

ELECTRODE HOLDERS, INERT-GAS-SHIELDED

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
General Electric Co., Schenectady 5, N. Y.
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
Northrop Aircraft, Inc., Hawthorne, Calif.

ELECTRODE PROCESSING EQUIPMENT

Aufhauser Bros. Co., 295 Madison Ave., New York City
Electric Arc, Inc., 152 Jelliff Ave., Newark
Meslo Machinery Co., 2443 Prospect Ave., Cleveland 15
Steiner-Ives Co., 16 Ave. L, Newark

ELECTRODES, ALUMINUM

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Aluminum Company of America, Gulf Bldg., Pittsburgh
Lincoln Electric Co., 12818 Coit Rd., Cleveland 1
Marquette Mfg. Co., Inc., 307 E. Hennepin St., Minneapolis 14
National Cylinder Gas Co., 205 W. Wacker, Chicago 7
Welding Alloys Mfg. Co., 744 Broad St., Newark
Wooldridge Aluminum Welding Products, Glastonbury, Conn.

ELECTRODES, ALUMINUM BRONZE

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
American Brass Co., 414 Meadow St., Waterbury 88, Conn.
Ampco Metal, Inc., 1745 S. 38th St., Milwaukee 4
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago 7
Wilson Welder & Metals Co., 60 E. 42nd St., New York City 17

ELECTRODES, BERYLLIUM COPPER

American Brass Co., 414 Meadow St., Waterbury 88, Conn.
Ampco Metal, Inc., 1745 S. 38th St., Milwaukee 4
P. R. Mallory & Co., Inc., 3029 E. Washington Str., Indianapolis 6
S-M-S Corporation, 1165 Harper, Detroit 11
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Welding Sales Engrg. Co., 8750 Grinnell, Detroit

ELECTRODES, BRONZE

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
American Arc Welders, Inc., Roseau, Minn.
American Brass Co., 414 Meadow St., Waterbury 88, Conn.
Ampco Metal, Inc., 1745 S. 38th St., Milwaukee 4
Arcos Corp., 401 N. Broad St., Philadelphia 8
Bridgeport Brass Co., Bridgeport, Conn.
Burdett Oxygen Co., 3300 Lakeside Ave., Cleveland 14
Central Steel & Wire Co., 3000 W. 51st St., Chicago 80
Chase Brass & Copper Co., Inc., 238 Grand St., Waterbury, Conn.
Eccles & Davies Machinery Co., Inc., 1910 Santa Fe Ave., Los Angeles 21
Electric Arc, Inc., 152 Jelliff Ave., Newark
Lincoln Electric Co., 12818 Coit Rd., Cleveland 1
Marquette Mfg. Co., Inc., 307 E. Hennepin St., Minneapolis 14
Mueller Brass Co., Port Huron, Mich.
National Cylinder Gas Co., 205 W. Wacker, Chicago 7
C. E. Phillips & Company, 2750 Poplar Street, Detroit 8
Seymour Mfg. Co., 15 Franklin St., Seymour, Conn.
Steel Sales Corp., 3348 S. Pulaski, Chicago 23
Welding Equipment & Supply Co., 223 Leib St., Detroit 7
Wilson Welder & Metals Co., 60 E. 42nd St., New York City 17

ELECTRODES, CARBON-ARC

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Albert & J. M. Anderson Mfg. Co., 289 A Street, Boston 10
American Agile Corp., 5806 Hough Ave., Cleveland, O.
American Brass Co., 414 Meadow St., Waterbury 88, Conn.
Becker Bros. Carbon Co., 3450 S. 52nd Ave., Cicero, 50, Ill.
Central Steel & Wire Co., 3000 W. 51st St., Chicago 80
Joseph Dixon Crucible Co., 167 Wayne St., Jersey City 3, N. J.
Electric Arc, Inc., 152 Jelliff Ave., Newark
Lincoln Electric Co., 12818 Coit Rd., Cleveland 1
Marquette Mfg. Co., Inc., 307 E. Hennepin St., Minneapolis 14
National Carbon Co., Inc., Madison & W. 117th, Cleveland 1
National Cylinder Gas Co., 205 W. Wacker, Chicago 7
Page Steel & Wire Div., American Chain & Cable Co., Inc., Monessen, Pa.
Speer Carbon Co., St. Marys, Pa.
Stackpole Carbon Co., St. Marys, Pa.
Steel Sales Corp, 3348 S. Pulaski, Chicago 23
Trindl Products Ltd., 17 E. 23rd St., Chicago 16
Wall-Colmonoy Corp., 720 Fisher Bldg., Detroit 2
Westinghouse Elec. & Mfg. Co., East Pittsburgh
Wilson Welder & Metals Co., 60 E. 42nd St., New York City 17

ELECTRODES, CAST IRON

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
American Agile Corp., 5806 Hough Ave., Cleveland
American Arc Welders, Inc., Roseau, Minn.
Arcos Corporation, 401 N. Broad St., Philadelphia 8
Burdett Oxygen Co., 3300 Lakeside Ave., Cleveland 14
Central Steel & Wire Co., 3000 W. 51st St., Chicago 80
The Champion Rivet Co., East 108th & Harvard Ave., Cleveland 5
Chicago Hardware Foundry Co., North Chicago, Ill.
Electric Arc, Inc., 152 Jelliff Ave., Newark
Eutectic Welding Alloys, Co., 40 Worth St., New York City 13
General Electric Co., Schenectady 5, N. Y.
Harnischfeger Corp., 4400 W. National Ave., Milwaukee 14
Hobart Bros. Co., Troy 1, O.
Larkin Lectro Products Co., 220 Taaffe Pl., Brooklyn 5
Lincoln Electric Co., 12818 Coit Rd., Cleveland 1
Marquette Mfg. Co., Inc., 307 E. Hennepin St., Minneapolis 14
McKay Co., York, Pa.
National Carbon Co., Inc., Madison & W. 117th St., Cleveland 1
National Cylinder Gas Co., 205 W. Wacker, Chicago
Northeast Metals Co., 4124 Torresdale, Philadelphia 24
C. E. Phillips & Co., 2750 Poplar St., Detroit 8
Rail Supply Co., 110 E. 42nd St., New York City 17
Resisto-Loy Company, 127 Baylis, S. W., Grand Rapids 7, Mich.
A. O. Smith Corp., 27th & Hopkins, Milwaukee
Special Welding Alloy Co., Inc., 27-33 Jackson, Long Island City, N. Y.
Standard Steel & Wire Co., Bolivar, Pa.
Steel Sales Corp., 3348 S. Pulaski, Chicago 23
U. S. Steel Supply Co., 1319 Wabansia Ave., Chicago 90
Welding Equip. & Sup. Co., 223 Leib, Detroit 7
Westinghouse Elec. & Mfg. Co., E. Pittsburgh
Wilson Welder & Metals Co., 60 E. 42nd St., New York City 17

ELECTRODES, COPPER

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
American Arc Welders, Inc., Roseau, Minn.
American Brass Co., 414 Meadow St., Waterbury 88, Conn.
Ampco Metal, Inc., 1745 S. 38th St., Milwaukee 4
Eastern Welding Equipment Company, 17 West 60th St., New York City 23
Eutectic Welding Alloys Co., 40 Worth Street, New York City 13
Krembs & Co., 669 W. Ohio St., Chicago 10
Lincoln Electric Co., 12818 Coit Rd., Cleveland 1
Marquette Mfg. Co., Inc., 307 E. Hennepin, Minneapolis 14
National Cylinder Gas Co., 205 W. Wacker, Chicago 7
C. E. Phillips & Company, 2750 Poplar St., Detroit 8
U. S. Steel Supply Co., 1319 Wabansia Ave., Chicago 90
Welding Engineering Co., 264 E. Ogden, Milwaukee 2
Welding Equip. & Sup. Co., 223 Leib, Detroit 7
Welding Sales Engrg. Co., 8750 Grinnell, Detroit

ELECTRODES, 11-14% MANGANESE

American Agile Corp., 5806 Hough Ave., Cleveland, Ohio
American Manganese Steel Div. of American Brake Shoe Co., 389 E. 14th St., Chicago Heights, Ill.
Arcos Corp., 401 N. Broad St., Philadelphia 8
Central Steel & Wire Co., 3000 W. 51st St., Chicago 80
Champion Rivet Co., The, East 108th & Harvard Ave., Cleveland 5
Lincoln Electric Co., 12818 Coit Rd., Cleveland 1
Manganese Steel Forge Co., Richmond St. & Castor Ave., Philadelphia
Marquette Mfg. Co., Inc., 307 E. Hennepin St., Minneapolis 14
Metal & Thermit Corp., 120 Broadway, New York City 5
National Cylinder Gas Co., 205 W. Wacker, Chicago 7
Standard Steel & Wire Co., Bolivar, Pa.
Steel Sales Corp., 3348 S. Pulaski, Chicago 23
Stoody Co., 1135 W. Slauson Ave., Whittier, Calif.
Stulz-Sickles Co., 134-142 Lafayette St., Newark 5
Taylor-Wharton Iron & Steel Co., Easton, Pa.
U. S. Steel Supply Co., 1319 Wabansia Ave., Chicago 90

ELECTRODES, HARD-FACING

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Allied Weldcraft Inc., 601 Kentucky Ave., Indianapolis
American Agile Corp., 5806 Hough Ave., Cleveland
American Manganese Steel Div. of American Brake Shoe Co., 389 E. 14th St., Chicago Heights, Ill.
Arcos Corporation, 401 N. Broad St., Philadelphia 8
Bergstrom Alloy Corp., Reno, Nev.
Bingrod Co., Kalamazoo, Mich.
Callite Tungsten Corporation, 549 Thirty-ninth St., Union City, N. J.
Central Steel & Wire Co., 3000 W. 51st St., Chicago 80
Champion Rivet Co., The, E. 108th & Harvard Ave., Cleveland 5
Chicago Hardware Foundry Co., North Chicago, Ill.
Coast Metals, Inc., 1232 Camden Ave., S. W. Canton 6, O.
Commercial Gas Corp., 286 Carey Ave., Wilkes Barre, Pa.
Delloy Metals, 3rd and Huntingdon, Philadelphia
Diamalloy Company, Gowanda, N. Y.
Dymonhard Corp., 250 W. 57th St., New York City
Eastern Welding Equipment Co., 17 W. 60th St., New York City 23
Electric Arc, Inc., 152 Jelliff Ave., Newark
Eutectic Welding Alloys Co., 40 Worth St., New York City 13
General Electric Co., Schenectady 5, N. Y.
Harnischfeger Corp., 4400 W. National Ave., Milwaukee 14
Haynes Stellite Co., 30 East 42nd St., New York City 17
Kerk-Aloy Co., Bloomington, Ind.
R. G. LeTourneau, Inc., Peoria, Ill.
Lincoln Electric Co., 12818 Coit Rd., Cleveland 1
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
Marquette Mfg. Co., Inc., 307 E. Hennepin St., Minneapolis 14
McKay Co., York, Pa.

ELECTRODES, HARD-FACING (Cont.)

Metal & Thermit Corp., 120 Broadway, New York City 5
National Cylinder Gas Co., 205 W. Wacker, Chicago 7
Osage Metal Co., Inc., Oklahoma City 8, Okla.
Resisto-Loy Co., 127 Baylis St., S. W., Grand Rapids, Mich.
A. O. Smith Corp., 27th & Hopkins, Milwaukee
Special Welding Alloys Co., Inc., 27-26 Jackson, Long Island City, N. Y.
Standard Steel & Wire Co., Bolivar, Pa.
Steel Sales Corp., 3348 S. Pulaski, Chicago 23
Steody Co., 1135 W. Slauson Ave., Whittier, Calif.
Stulz-Sickles Co., 134-142 Lafayette St., Newark 5
U. S. Steel Supply Co., 1319 Wabansia Ave., Chicago 90
Wall-Colmonoy Corp., 720 Fisher Bldg., Detroit 2
Westinghouse Elec. & Mfg. Co., E. Pittsburgh
Wilson Welder & Metals Co., 60 E. 42nd St., New York City 17

ELECTRODES, HEAT-RESISTING

Allegheny Ludlum Steel Corp., Brackenridge 2, Pa.
American Manganese Steel Div. of American Brake Shoe Co., 389 E. 14th St., Chicago Heights, Ill.
Arcos Corp., 401 N. Broad St., Philadelphia 8
Central Steel & Wire Co., 3000 W. 51st St., Chicago 80
Delloy Metals, 3rd and Huntingdon, Philadelphia
Dymonhard Corp., 250 W. 57th St., New York City
Marquette Mfg. Co., Inc., 307 E. Hennepin St., Minneapolis 14
McKay Co., York, Pa.
Metal & Thermit Corp., 120 Broadway, New York City 5
Page Steel & Wire Div. of American Chain & Cable Co. Inc., Monessen, Pa.
A. O. Smith Corp., 27th & Hopkins, Milwaukee
Steel Sales Corp., 3348 S. Pulaski, Chicago 23
U. S. Steel Supply Co., 1319 Wabansia Ave., Chicago 90

ELECTRODES, INCONEL

Arcos Corp., 401 N. Broad St., Philadelphia 8
Eutectic Welding Alloys Company, 40 Worth St., New York City 13
International Nickel Co., Inc., 67 Wall St., New York City 5
Lincoln Electric Co., 12818 Coit Rd., Cleveland 1
Steel Sales Corp., 3348 S. Pulaski, Chicago 23

ELECTRODES, MANGANESE-NICKEL

American Agile Corp., 5806 Hough Ave., Cleveland, Ohio
American Manganese Steel Div. of American Brake Shoe Co., 389 E. 14th St., Chicago Heights, Ill.
Arcos Corp., 401 N. Broad St., Philadelphia 8
Central Steel & Wire Co., 3000 W. 51st St., Chicago 80
Champion Rivet Co., The, E. 108th & Harvard Ave., Cleveland 5
Harnischfeger Corp., 4400 W. National Ave., Milwaukee 14
Marquette Mfg. Co., Inc., 307 E. Hennepin St., Minneapolis 14
National Cylinder Co., 205 W. Wacker Drive, Chicago 7
A. O. Smith Corp., 27th & Hopkins, Milwaukee
Standard Steel & Wire Co., Bolivar, Pa.
Steel Sales Corp., 3348 S. Pulaski, Chicago 23
Stulz-Sickles Co., 134-142 Lafayette St., Newark 5
Taylor-Wharton Iron & Steel Co., Easton, Pa.
Universal Power Corporation, 4899 Euclid Ave., Cleveland 3
Westinghouse Electric and Mfg. Co., East Pittsburgh, Pa.
Wilson Welder & Metals Co., 60 E. 42nd St., New York City 17

ELECTRODES, MONEL

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Arcos Corp., 401 N. Broad St., Philadelphia 8
Eutectic Welding Alloys Company, 40 Worth Street, New York City 13
Harnischfeger Corp., 4400 W. National Ave., Milwaukee 14
International Nickel Co., Inc., 67 Wall St., New York City 5
Marquette Mfg. Co., Inc., 301 E. Hennepin St., Minneapolis 14
National Cylinder Gas Co., 205 W. Wacker, Chicago 7
C. E. Phillips & Company, 2750 Poplar St., Detroit 8
Steel Sales Corp., 3348 S. Pulaski, Chicago 23
Wilson Welder & Metals Co., Inc., 60 East 42nd St., New York City 17

ELECTRODES, NICKEL

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Arcos Corp., 401 N. Broad St., Philadelphia 8
Eutectic Welding Alloys Co., 40 Worth Street, New York City 13
Harnischfeger Corp., 4400 W. National Ave., Milwaukee 14
International Nickel Co., Inc., 67 Wall St., New York City 5
Marquette Mfg. Co., Inc., 301 E. Hennepin St., Minneapolis 14
Metal & Thermit Corp., 120 Broadway, New York City 5
National Cylinder Gas Co., 205 W. Wacker, Chicago 7
Steel Sales Corp., 3348 S. Pulaski, Chicago 23
Standard Steel & Wire Co., Bolivar, Pa.

ELECTRODES, RESISTANCE WELDING

Acme Elec. Welder Co., 2618 Fruitland Rd., Los Angeles 11
American Brass Co., 414 Meadow St., Waterbury 88, Conn.
Dyer Welder & Engineering Company, 7 East 9th St., Kansas City 8, Mo.
Electroloy Co., Inc., 1600 Seaview Ave., Bridgeport, Conn.
The Federal Machine & Welder Company, 212 Dana Street, Warren, O.
P. R. Mallory Co., Inc., 3029 E. Washington, Indianapolis 6
National Elec. Welding Mach. Co., 1846 N. Trumbull St., Bay City, Mich.
Pier Equip. Mfg. Co., 502 Cross, Benton Harbor, Mich.
S-M-S Corporation, 1165 Harper, Detroit 11
Thomson-Gibb Electric Welding Co., 161 Pleasant, Lynn, Mass.
Universal Power Corp., 4899 Euclid Ave., Cleveland 3
Welding Machines Mfg. Co., 17325 Lamont Ave., Detroit 12
Welding Sales Engineering Co., 8750 Grinnell, Detroit 15
Weltronic Corp., 3080 S. Outer Dr., Detroit
Westinghouse Elec. & Mfg. Co., E. Pittsburgh

ELECTRODES, STAINLESS STEEL

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Allegheny Ludlum Steel Corp., Brackenridge 2, Pa.
Allied Weldcraft, Inc., 601 Kentucky Ave., Indianapolis
Alloy Rods Co., York, Pa.
Arcos Corp., 401 N. Broad St., Philadelphia 8
Central Steel & Wire Co., 3000 W. 51st St., Chicago 80
Champion Rivet Co., The, E. 108th & Harvard Ave., Cleveland 5
Chicago Steel & Wire Co., 10257 S. Torrence St., Chicago
Crucible Steel Co. of America, New York City
Harnischfeger Corp., 4400 W. National Ave., Milwaukee 14
Lincoln Electric Co., 12818 Coit Rd., Cleveland 1
Marquette Mfg. Co., Inc., 307 E. Hennepin St., Minneapolis 14
Maurath, Inc., Cleveland
McKay Co., York, Pa.
Metal & Thermit Corp., 120 Broadway, New York City 5
National Cylinder Gas Co., 205 W. Wacker, Chicago 7
Page Steel & Wire Div., American Chain & Cable Co., Inc., Monessen, Pa.
Reid-Avery Co., Cleveland & Chesapeake Ave., Baltimore 22
Joseph T. Ryerson & Son Inc., 2558 W. 16th St., Chicago
A. O. Smith Corp., 27th & Hopkins, Milwaukee
Special Welding Alloy Co., Inc., 27-33 Jackson, Long Island City, N. Y.
Standard Electrode & Mfg. Corp., 40 East Wister St., Philadelphia 44
Westinghouse Electric and Mfg. Co., East Pittsburgh, Pa.
Wilson Welder & Metals Co., 60 E. 42nd St., New York City 17

ELECTRODES, STEEL MILD

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Allied Weldcraft, Inc., 601 Kentucky Ave., Indianapolis
American Agile Corp., 5806 Hough Ave., Cleveland
American Rolling Mill Co., Middletown, O.
Capitol Steel Corporation, 15 E. 40th St., New York City
Anthony Carlin Co., 2717 E. 75th St., Cleveland 4
Central Steel & Wire Co., 3000 W. 51st St., Chicago
Champion Rivet Co., The, E. 108th & Harvard Ave., Cleveland 5
Chicago Steel & Wire Co., 10257 S. Torrence Ave., Chicago
Electric Arc, Inc., 152 Jolliff Ave., Newark
General Electric Co., Schenectady 5, N. Y.
Harnischfeger Corp., 4400 W. National Ave., Milwaukee 14
Hobart Bros. Co., Troy 1, O.
Larkin Lectro Products Co., 220 Taaffe Place, Brooklyn 5
R. G. LeTourneau, Inc., Peoria, Ill.
Lincoln Electric Co., 12818 Coit Rd., Cleveland 1
Marquette Mfg. Co., Inc., 307 E. Hennepin St., Minneapolis 14
McKay Co., York, Pa.
Metal & Thermit Corp., 120 Broadway, New York City 5
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago 7
Page Steel & Wire Div., American Chain & Cable Co., Monessen, Pa.
Reid-Avery Co., Cleveland & Chesapeake Ave., Baltimore 22
A. O. Smith Corp., 27th and Hopkins, Milwaukee
Special Welding Alloy Co., Inc., 27-33 Jackson, Long Island City, N. Y.
Standard Steel & Wire Co., Bolivar, Pa.
Steel Sales Corp., 3348 S. Pulaski, Chicago 23
Trindl Products Ltd., 17 E. 23rd St., Chicago 16
Westinghouse Elec. & Mfg. Co., E. Pittsburgh
Wilson Welder & Metals Co., 60 E. 42nd St., New York City 17

ELECTRODES, TOOL & DIE

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
American Agile Corp., 5806 Hough Ave., Cleveland
American Manganese Steel Div. of American Brake Shoe Co., 389 E. 14th St., Chicago Heights, Ill.
Central Steel & Wire Co., 3000 W. 51st St., Chicago 80
Dymonhard Corp., 250 W. 57th St., New York City
Electric Arc, Inc., 152 Jolliff Ave., Newark
Eutectic Welding Alloys Co., 40 Worth St., New York City 13
Gorham Tool Co., 14400 Woodrow Wilson, Detroit
Harnischfeger Corp., 4400 W. National Ave., Milwaukee 14
Lincoln Electric Co., 12818 Coit Rd., Cleveland 1
McKay Co., York, Pa.
Pelton-Kurtz Supply Co., 2609 E. Larned St., Detroit
C. E. Phillips & Co., 2750 Poplar St., Detroit 8
Resisto-Loy Company, 127 Baylis S. W., Grand Rapids 7, Mich.
A. O. Smith Corp., 27th and Hopkins, Milwaukee
Steel Sales Corp., 3348 S. Pulaski, Chicago 23
U. S. Steel Supply Co., 1319 Wabansia Ave., Chicago
Universal Power Corp., 4899 Euclid Ave., Cleveland 3
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Welding Equip. & Sup. Co., 223 Leib, Detroit 7
Williams & Co., Inc., 901 Pennsylvania Ave., Pittsburgh

ELECTRODES, TUNGSTEN

Callite Tungsten Corp., 549 Thirty-ninth St., Union City, N. J.
Cleveland Tungsten, Inc., 10200 Meech Ave., Cleveland
Fansteel Metallurgical Corp., North Chicago, Ill.
General Electric Co., Schenectady 5, N. Y.

ELECTRONIC CONTROLS

Cutler Hammer, Inc., 315 N. 12th St., Milwaukee 1
Federal Machine & Welder Co., 212 Dana St., Warren, O.
General Electric Co., Schenectady 5, N. Y.
Glenn-Roberts Company, 1009 Fruitvale Ave., Oakland 1, Calif.
Photovolt Corp., 95 Madison Ave., New York City
Westinghouse Electric & Mfg. Co., East Pittsburgh

ELECTRONIC CONTROLS, RESISTANCE WELDING

American Elec. Fusion Corp., 2600 Diversey Ave., Chicago 47
Cutler-Hammer, Inc., 315 N. 12th St., Milwaukee 1
Eisler Engineering Co., Inc., 749 S. 13th St., Newark 3
Electric Controller & Mfg. Co., 2700 E. 79th St., Cleveland
Federal Mach. & Welder Co., 212 Dana St., Warren, Ohio
General Electric Co., Schenectady 5, N. Y.
Hercules Elec. & Mfg. Co., Inc., 2416 Atlantic Ave., Brooklyn 33
Photovolt Corp., 95 Madison Ave., New York City
Pier Equip. Mfg. Co., 502 Cross, Benton Harbor, Mich.
Sciaky Bros., 4915 W. 67th St., Chicago 38
Weltronic Co., 3080 E. Outer Drive, Detroit, Mich.
Westinghouse Electric & Mfg. Co., E. Pittsburgh

ELECTRONIC CONTROL TUBES

American Electric Fusion Corp., 2600 Diversey Ave., Chicago 47
Federal Machine & Welder Company, 212 Dana Street, Warren, O.
General Electric Co., Schenectady 5, N. Y.
United Electronics Company, 42 Spring Street, Newark 2
Westinghouse Electric & Mfg. Co., E. Pittsburgh

EYE DROPS

Carhoff Co., 3050 Kensington Rd., Cleveland Heights, O.
Murine Co., 660 N. Wabash, Chicago

FACE SHIELDS, ARC WELDING

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
American Agile Corp., 5806 Hough Ave., Cleveland
American Industrial Safety Equipment Inc., 397 Bridge St., Brooklyn 1
American Optical Co., 16 Mechanic St., Southbridge, Mass.
B & H Welders Supplies, 403 Fourth St., Portsmouth, Va.
Boyer-Campbell Co., 6540 Antoine St., Detroit
Chicago Eye Shield Co., 2300 Warren Blvd., Chicago 12
Davis Emergency Equip. Co., Inc., 45 Halleck St., Newark 4
Dockson Corp., 3839 Wabash, Detroit 8
Eastern Equipment Co., Inc., Willow Grove, Pa.
Eastern Safety Clothing Co., 23 W. 60th St., New York City 23

FACE SHIELDS, ARC WELDING (Cont.)

Electric Arc, Inc., 152 Jelliff Ave., Newark
Ergolyte Mfg. Co., 3627 N. Lawrence St., Philadelphia 40
Fibre-Metal Prod. Co., The, 5th and Tilghman St., Chester, Pa.
General Electric Co., Schenectady 5, N. Y.
General Scientific Equip. Co., 1346 W. Somerset St., Philadelphia 32
Hobart Brothers Co., Troy 1, O.
Industrial Products Co., 2802 N. 4th St., Philadelphia 33
Jackson Products, 3265 Wight St., Detroit 7
Kimball Safety Prod. Co., 7314 Wade Park Ave., Cleveland 3
Larkin Lectro Products Co., 220 Taaffe Pl., Brooklyn 5
Lincoln Electric Co., 12818 Coit Rd., Cleveland 1
Marquette Mfg. Co., Inc., 307 E. Hennepin St., Minneapolis 14
Metro Mfg. Co., 38-11 31st St., Long Island City 1, N. Y.
Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago 7
Parker Safety Equipment Co., 785 Lyons Ave., Irvington, N. J.
Pulmosan Safety Equipment Corp., 176 Johnson St., Brooklyn 1, N. Y.
Rail Supply Co., 110 E. 42nd St., New York City 17
Safety Clothing & Equip. Co., 7016 Euclid Ave., Cleveland
Sellstrom Mfg. Co., 615 N. Aberdeen St., Chicago 22
Steel Sales Corp., 3348 S. Pulaski, Chicago 23
Trindl Prod. Ltd., 17 E. 23rd St., Chicago 16
United States Steel Supply Co., 1319 Wabansia, Chicago 90
Weldit Acetylene Co., 636 Bagley, Detroit 26
Welsh Mfg. Co., 58 Troy St., Providence 9, R. I.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh
Willson Products, Inc., 2nd and Washington Sts., Reading, Pa.
Wilson Welder & Metals Co. Inc., 60 E. 42nd St., New York City 17

FACE SHIELDS, GAS

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
American Industrial Safety Equipment Inc., 397 Bridge St., Brooklyn 1
American Optical Co., 16 Mechanic St., Southbridge, Mass.
B & H Welder's Supplies, 403 Fourth Street, Portsmouth, Va.
Boyer-Campbell Co., 6540 Antoine St., Detroit
Chicago Eye Shield Company, 2300 Warren Blvd., Chicago 12
Davis Emergency Equip. Co., Inc., 45 Halleck St., Newark 4
Dockson Corp., 3839 Wabash, Detroit 8
Eastern Equipment Co., Inc., Willow Grove, Pa.
Eastern Safety Clothing Co., 23 W. 60th St., New York City 23
Eastern Welding Equipment Co., 17 W. 60th St., New York City 23
Fibre-Metal Prod. Co., 5th and Tilghman St., Chester, Pa.
General Scientific Equip. Co., 1346 W. Somerset St., Philadelphia 32
Industrial Products Co., 2802 N. 4th St., Philadelphia 33
Jackson Products, 3265 Wight St., Detroit 7
Kimball Safety Prod. Co., 7314 Wade Park Ave., Cleveland 3
Liquid Carbonic Corp., Wall Chemicals Div., 3100 S. Kedzie Ave., Chicago 23
Metro Mfg. Co., 38-11 31st St., Long Island City 1
Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago 7
Parker Safety Equipment Co., 785 Lyons Ave., Irvington, N. J.
Pulmosan Safety Equipment Corp., 176 Johnson St., Brooklyn 1, N. Y.
Rail Supply Co., 110 E. 42nd St., New York City 17
Sellstrom Mfg. Co., 615 N. Aberdeen St., Chicago 22
Standard Safety Equipment Co., 232 W. Ontario St., Chicago 10
Superior Oxy-Acetylene Mach. Co., 1102 High St., Hamilton, O.
Weldit Acetylene Co., 636 Bagley, Detroit
Welsh Mfg. Co., 58 Troy St., Providence 9, R. I.
Willson Products, Inc., 2nd and Washington Sts., Reading, Pa.

FEEDERS, ROD, AUTOMATIC

Aufhauser Bros. Co., 295 Madison Ave., New York City
Electric Arc, Inc., 152 Jelliff Ave., Newark
General Electric Co., Schenectady 5, N. Y.
Lincoln Electric Co., 12818 Coit Rd., Cleveland 1
Moslo Machinery Co., 2443 Prospect Ave., Cleveland 15
Una Welding, Inc., 1615 Collamer Ave., Cleveland 10
Victor Equipment Co., 844-54 Folsom St., San Francisco 7

FILLER, WELD

Aluminum Company of America, Gulf Bldg., Pittsburgh
American Brass Co., 414 Meadow St., Waterbury 88, Conn.
American Manganese Steel Div. of American Brake Shoe Co., 389 E. 14th St., Chicago Heights, Ill.
Electric Arc, Inc., 152 Jelliff Ave., Newark
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
Manganese Steel Forge Co., Richmond St., & Castor Ave., Philadelphia
Perry Equip. & Supply Co., 1515 W. Thompson, Philadelphia
A. O. Smith Corp., 27th and Hopkins, Milwaukee
Victor Equipment Co., 844-54 Folsom St., San Francisco 7

FILMS FOR RADIOGRAPHY

Eastman Kodak Co., X-Ray Div., Rochester 4
Picker X-Ray Corp., 300 4th Ave., New York City 10
Westinghouse Elec. & Mfg. Co., X-Ray Division, Baltimore

FILTERS, WELDER

Badger Mfg. & Sales Co., 327 E. Brown St., Milwaukee 12

FIRE EXTINGUISHERS

American Allsafe Co., Inc., 1245 Niagara St., Buffalo 13, N. Y.
American-La France-Foamite Corp., Elmira, N. Y.
General Detroit Corp., 2272 E. Jefferson Ave., Detroit
Walter Kidde & Co. Inc., Belleville, N. J.
Pulmosan Safety Equipment Corp., 176 Johnson St., Brooklyn 1

FIRE RETARDANTS (FOR FLAME-PROOFING CLOTHING, ETC.)

Croton Chemical Corporation, 57 Commerce St., Brooklyn 31
E. I. DuPont de Nemours & Co., Inc., Wilmington 98, Del.
Wayne Chemical Products Co., Copeland & M. C. R. R., Detroit 17

FIRST AID KITS

American Allsafe Company, Inc., 1245 Niagara St., Buffalo 13, N. Y.
Boyer-Campbell Co., 6540 Antoine St., Detroit
Davis Emergency Equip. Co., Inc., 45 Halleck St., Newark 4
Carter Lockard Co., 225 W. 11th St., Los Angeles
General Scientific Equip. Co., 1346 W. Somerset St., Philadelphia
Industrial Products Co., 2802 N. 4th St., Philadelphia 33
Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh
Pulmosan Safety Equipment Corp., 176 Johnson St., Brooklyn 1
Standard Safety Equip. Co., 232 W. Ontario St., Chicago 10

FITTINGS, TANK

Aluminum Company of America, Gulf Bldg., Pittsburgh
Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago
Kropp Forge Co., 5301 W. Roosevelt Road, Chicago
Lukens Steel Co., So. First Ave., Coatesville, Pa.
Tube Turns, Inc., 224 E. Broadway, Louisville
Weldit Acetylene Co., 638 Bagley Ave., Detroit 26

FLAME-CUTTING MACHINES

(See "CUTTING MACHINES, GAS")

FLAME-HARDENING EQUIPMENT

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Harris Calorific Company, 5501 Cass Ave., Cleveland 2
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
Liquid Carbonic Corp., Wall Chemicals Div., 3100 S. Kedzie Ave., Chicago 23
Modern Engineering Co., Inc., 3401 Pine Blvd., St. Louis, Mo.
National Cylinder Gas Co., 205 W. Wacker, Chicago 7
Victor Equipment Co., 844-54 Folsom St., San Francisco 7

FLANGING MACHINES

McCabe Mfg. Co., 9 Water St., Lawrence, Mass.
Tube Turns, 224 E. Broadway, Louisville

FLASH PREVENTIVE

Standard Safety Equip. Co., 232 W. Ontario St., Chicago 10
U. S. Steel Supply Co., 1319 Wabansia, Chicago 90
Wayne Chemical Prod. Co., Copeland & M. C. R. R., Detroit 17

FLASH WELDERS, RESISTANCE

Agnew Electric Company, Milford, Mich.
Acme Elec. Welder Co., 2618 Fruitland Rd., Los Angeles
American Elec. Fusion Corp., 2600 Diversey Ave., Chicago
Federal Mach. & Welder Co., 212 Dana St., Warren, O.
Larkin Lectro Products Co., 220 Taaffe Place, Brooklyn 5
Micro Products Co., 20 North Wacker Drive, Chicago 6
National Elec. Welding Mach. Co., 1846 N. Trumbull St., Bay City, Mich.
Progressive Welder Co., 3050 E. Outer Dr., Detroit 12
Sciaky Bros., 4915 W. 67th St., Chicago 38
Taylor-Winfield Corp., Warren, O.
Thomson-Gibb Elec. Weld. Co., 161 Pleasant St., Lynn, Mass.
Universal Power Corp., 4899 Euclid Ave., Cleveland 3
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Welding Machines Mfg. Co., 17325 Lamont Ave., Detroit 12

FLEXIBLE SHAFT EQUIPMENT

R. G. Haskins Co., 615 S. California, Chicago
Mall Tool Company, 7740 South Chicago Ave., Chicago 19
Stow Mfg. Co., 443 State St., Binghamton, N. Y.
N. A. Strand & Co., 5001 N. Wolcott Ave., Chicago
Wyzenbeek and Staff, Inc., 838 W. Hubbard St., Chicago

FLUX DISPENSERS

Automatic Gasflux Mfg. Co., 198 Wayne St., Mansfield, O.
Linde Air Products Co., The, 30 E. 42nd St., New York City 17

FLUXES

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Alwarth Chemical Corp., 366 Madison Ave., New York City
American Chemical & Flux Co., 95 Lorimer St., Brooklyn 6
American Manganese Steel Div. of American Brake Shoe Co., 389 E. 14th St., Chicago Heights, Ill.
American Products Corp., 422 South Dearborn St., Chicago 5
American Solder & Flux Co., 2152 E. Norris St., Philadelphia 25
Anti-Borax Compound Co., 1506 Wall, Ft. Wayne 6, Ind.
Bastian-Blessing Co., 4201 Peterson Ave., Chicago 30
Burdett Oxygen Co., 3300 Lakeside Ave., Cleveland 14
Central Steel & Wire Co., 3000 W. 51st St., Chicago 80
Chase Brass & Copper Co., Inc., 238 Grand St., Waterbury, Conn.
Chicago Hardware Foundry Co., North Chicago, Ill.
Childs Aluminum Solder Company, 4020 Tenth Ave., New York City 34
Cleanweld Prod. Co., 432 E. 71st St., New York City
Cortland Welding Compound Co., 12-16 Crawford St., Cortland, N. Y.
Craftsweld Equip. Corp., 2626 Jackson Ave., Long Island City, N. Y.
Croton Chemical Corp., 51 Commerce St., Brooklyn 31
Dockson Corporation, 3839 Wabash Ave., Detroit 8,
E. I. DuPont de Nemours & Co., Inc., Wilmington 98, Del.
Eastern Welding Equipment Company, 17 West 60th St., New York City 23
Eutectic Welding Alloys Co., 40 Worth St., New York City 13
Foote Mineral Company, 1609 Summer St., Philadelphia 3, Pa.
The Gasflux Co., 198 Wayne St., Mansfield, O.
General Welding & Equip. Co., 268 Northampton St., Boston 18
Goldsmith Bros., Smelting & Ref. Co., 58 E. Washington St., Chicago
Handy & Harman, 82 Fulton St., New York City 7
Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago
Lloyd S. Johnson Co., 2241 Indiana Ave., Chicago
Kre-Co Multichemic Flux Div., Charles W. Kreig Co., 52 Dickerson St., Newark 4
Krembs and Company, 669 W. Ohio St., Chicago 10
Lincoln Electric Co., 12818 Coit Rd., Cleveland 1
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
P. R. Mallory & Co., Inc., 3028 E. Washington St., Indianapolis 6
Marquette Mfg. Co., Inc., 307 E. Hennepin St., Minneapolis 14
Metal Bond Mfg. Co., 3201 Kossuth Ave., St. Louis 7
Metallizing Company of America, 1330 W. Congress St., Chicago 7
Metro Mfg. Co., 38-11 31st St., Long Island City 1, N. Y.
Modern Engineering Co., Inc., 3401 Pine, St. Louis
Morey Flux & Chem. Co., Wilmington 99, Del.
National Cylinder Gas Co., 205 W. Wacker, Chicago 7
Perry Equip. & Supply Co., 1515 W. Thompson, Philadelphia
Joseph T. Ryerson & Son Inc., 2558 W. 16th St., Chicago
Sherman & Co., 193 Canal St., New York City 13
Smith Welding Equipment Corp., 2633 Fourth Street, S. E., Minneapolis 14
Special Chemicals Co., 30 Irving Place, New York City
Special Welding Alloy Co., 27-33 Jackson, Long Island City, N. Y.
Standard Steel & Wire Co., Bolivar, Pa.
Steel Sales Corp., 3348 S. Pulaski, Chicago 23

FLUXES (Cont.)

Superior Flux Co., 913 Public Square Bldg., Cleveland
Superior Oxy-Acetylene Mach. Co., 1102 High St., Hamilton, O.
Torit Manufacturing Co., 292 Walnut St., St. Paul 2
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Welding Alloys Mfg. Co., 744 Broad St., Newark
Welding Equip. & Sup. Co., 223 Leib, Detroit
Weldit Acetylene Co., 636 Bagley, Detroit 26
Westinghouse Electric & Mfg. Co., E. Pittsburgh
Wooldridge Aluminum Welding Products, Glastonbury, Conn.
York Engineering Co., 3349 W. Ogden Ave., Chicago 23

FLUXES, ALUMINUM

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Alwarth Chemical Corp., 366 Madison Ave., New York, N. Y.
Aluminum Company of America Gulf Bldg., Pittsburgh
American Chemical & Flux Co., 95 Lorimer St., Brooklyn 6
American Products Corp., 422 South Dearborn St., Chicago 5
American Solder & Flux Co., 2152 E. Norris St., Philadelphia 25
Anti-Borax Compound Co., 1506 Wall, Ft. Wayne 6, Ind.
Burdett Oxygen Co., 3300 Lakeside Ave., Cleveland 14
Central Steel & Wire Co., 3000 W. 51st St., Chicago 80
Childs Aluminum Solder Company, 4020 Tenth Ave., New York City 34
Chicago Hardware Foundry Co., North Chicago, Ill.
Cleanweld Prod. Co., 432 E. 71st St., New York City
Cortland Welding Compound Co., 12-16 Crawford St., Cortland, N. Y.
Craftsweld Equip. Corp., 2626 Jackson Ave., Long Island City, N. Y.
Croton Chemical Corp., 57 Commerce St., Brooklyn 31
Eastern Welding Equipment Company, 17 West 60th St., New York City 23
Eutectic Welding Alloys Co., 40 Worth St., New York City 13
General Welding & Equip. Co., 268 Northampton St., Boston 18
Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago
Lloyd S. Johnson Co., 2241 Indiana Ave., Chicago
Krembs and Company, 671 W. Ohio St., Chicago 10
Linde Air Prod. Co., 30 E. 42nd St., New York City 17
Marquette Mfg. Co., 307 E. Hennepin, Minneapolis 14
Metal Bond Mfg. Co., 3201 Kossuth Ave., St. Louis 7
Metro Mfg. Co., 38-11 31st St., Long Island City 1, N. Y.
Modern Engineering Co., Inc., 3401 Pine, St. Louis
Morey Flux & Chem. Co., Wilmington 99, Del.
National Cylinder Gas Co., 205 W. Wacker, Chicago 7
Northeast Metals Co., 4124 Torresdale, Philadelphia 24
Park Stewart, Worthington, Pa.
Smith Welding Equipment Corp., 2633 Fourth Street S. E. Minneapolis
Special Welding Alloy Co., Inc., 27-33 Jackson, Long Island City, N. Y.
Standard Steel & Wire Co., Bolivar, Pa.
Steel Sales Corp., 3348 S. Pulaski, Chicago 23
Superior Flux Co., 913 Public Square Bldg., Cleveland
Torit Manufacturing Co., 292 Walnut St., St. Paul 2
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Welding Alloys Mfg. Co., 744 Broad St., Newark 2
Welding Equip. & Sup. Co., 223 Leib, Detroit
Weldit Acetylene Co., 636 Bagley, Detroit 26
Wooldridge Aluminum Welding Products, Glastonbury, Conn.

FLUXES, ALUMINUM BRONZE

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Alwarth Chemical Corp., 366 Madison Ave., New York, N. Y.
American Chemical & Flux Co., 95 Lorimer St., Brooklyn 6
American Products Corp., 422 South Dearborn St., Chicago 5
American Solder & Flux Co., 2152 E. Norris St., Philadelphia 25
Ampco Metal, Inc., 1745 S. 38th St., Milwaukee 4
Anti-Borax Compound Co., 1506 Wall, Ft. Wayne, 6, Ind.
Burdett Oxygen Co., 3300 Lakeside Ave., Cleveland 14
Croton Chemical Co., 57 Commerce St., Brooklyn 31
Eastern Welding Equipment Company, 17 West 60th St., New York City 23
Eutectic Welding Alloys Co., 40 Worth St., New York City 13
F. R. Faulk, 405 Penn Ave., Pittsburgh 22
Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago
Krembs and Company, 671 W. Ohio St., Chicago 10
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
Metal Bond Mfg. Co., 3201 Kossuth Ave., St. Louis 7
Metro Mfg. Co., 93-04 150th St., Jamaica 2, N. Y.
Modern Engineering Co., Inc., 3401 Pine, St. Louis
Morey Flux & Chem. Co., Wilmington 99, Del.
National Cylinder Gas Co., 205 W. Wacker, Chicago 7
Special Welding Alloy Co., Inc., 27-33 Jackson, Long Island City, N. Y.
Superior Flux Co., 913 Public Square Bldg., Cleveland
Torit Manufacturing Co., 292 Walnut St., St. Paul 2
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Weldit Acetylene Co., 636 Bagley, Detroit 26
Weldoloy Mfg. Co., 421 Canal St., New York City

FLUXES, BRAZING

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Alwarth Chemical Corp., 366 Madison Ave., New York, N. Y.
Aluminum Company of America, Gulf Bldg., Pittsburgh
American Chemical & Flux Co., 95 Lorimer St., Brooklyn 6
American Products Corp., 422 South Dearborn St., Chicago 5
American Solder & Flux Co., 2152 E. Norris St., Philadelphia 25
Anti-Borax Compound Co., 1506 Wall, Ft. Wayne 6, Ind.
Automatic Gasflux Mfg. Co., 198 Wayne St., Mansfield, O.
Burdett Oxygen Co., 3300 Lakeside Ave., Cleveland 14
Central Steel & Wire Co., 3000 W. 51st St., Chicago 80
Chicago Hardware Foundry Co., North Chicago, Ill.
Childs Aluminum Solder Company, 4020 Tenth Ave., New York City 34
Cleanweld Prod. Co., 432 E. 71st St., New York City
Cortland Welding Compound Co., 12-16 Crawford St., Cortland, N. Y.
Craftsweld Equip. Corp., 2626 Jackson Ave., Long Island City, N. Y.
Croton Chemical Co., 57 Commerce St., Brooklyn 31
Eastern Welding Equipment Co., 17 West 60th St., New York City 13
Eutectic Welding Alloys Co., 40 Worth St., New York City 13
F. R. Faulk, 405 Penn. Ave., Pittsburgh 22
The Gasflux Co., 198 Wayne St., Mansfield, O.
General Welding & Equip. Co., 268 Northampton St., Boston 18
Goldsmith Bros. Smelting & Ref. Co., 58 E. Washington St., Chicago 2
Handy & Harman, 82 Fulton St., New York City 7
Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago
International Nickel Co., 67 Wall St., New York City
Lloyd S. Johnson Co., 2241 Indiana Ave., Chicago
Kre-Co Multichemic Flux Div., Charles W. Kreig Co., 52 Dickerson St., Newark 4
Krembs and Company, 671 W. Ohio St., Chicago 10
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
P. R. Mallory & Co., Inc., 3029 E. Washington, Indianapolis 6
Marquette Mfg. Co., Inc., 307 E. Hennepin St., Minneapolis 14
Metal Bond Mfg. Co., 3201 Kossuth Ave., St. Louis 7
Metro Mfg. Co., 38-11 31st St., Long Island City 1, N. Y.
Modern Engineering Co., Inc., 3401 Pine, St. Louis
Morey Flux & Chem. Co., Wilmington 99, Del.
National Cylinder Gas Co., 205 W. Wacker, Chicago 7
Northeast Metals Company, 4124 Torresdale Ave., Philadelphia 24
Smith Welding Equipment Corp., 2633 Fourth Street, S. E., Minneapolis 14
Special Chemicals Co., 30 Irving Place, New York City
Special Welding Alloy Co., Inc., 27-33 Jackson, Long Island City, N. Y.
Steel Sales Corp., 3348 S. Pulaski, Chicago 23
Superior Flux Co., 913 Public Square Bldg., Cleveland
Torit Mfg. Co., 270 Walnut St., St. Paul
U. S. Steel Supply Co., 1319 Wabansia Ave., Chicago 9
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Welding Alloys Mfg. Co., 744 Broad St., Newark 2
Welding Equip. & Sup. Co., 223 Leib, Detroit
Weldit Acetylene Co., 636 Bagley, Detroit 26
Weldoloy Mfg. Co., 421 Canal St., New York City
York Engineering Co., 3349 W. Ogden Ave., Chicago 23

FLUXES, CAST IRON

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Alwarth Chemical Corp., 366 Madison Ave., New York, N. Y.
American Chemical & Flux Co., 95 Lorimer St., Brooklyn 6
American Products Corp., 422 South Dearborn St., Chicago 5
American Solder & Flux Co., 2152 E. Norris St., Philadelphia 25
Anti-Borax Compound Co., 1506 Wall, Ft. Wayne 6, Ind.
Burdett Oxygen Co., 3300 Lakeside Ave., Cleveland 14
Central Steel & Wire Co., 3000 W. 51st St., Chicago 80
Chicago Hardware Foundry, North Chicago, Ill.
Childs Aluminum Solder Company, 4020 Tenth Ave., New York City 34
Cleanweld Prod. Co., 432 E. 71st St., New York City
Cortland Welding Compound Co., 12-16 Crawford St., Cortland, N. Y.
Craftsweld Equip. Corp., 2626 Jackson Ave., Long Island City, N. Y.
Croton Chemical Corp., 57 Commerce St., Brooklyn 31
Eastern Welding Equipment Co., 17 West 60th St., New York City 23
Eutectic Welding Alloys Co., 40 Worth St., New York City 13
General Welding & Equip. Co., 268 Northampton St., Boston 18
Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago
Krembs and Company, 671 W. Ohio St., Chicago 10
Linde Air Products Co., 30 E. 42nd St., New York City 17
Marquette Mfg. Co., Inc., 307 E. Hennepin St., Minneapolis 14
Metal Bond Mfg. Co., 3201 Kossuth Ave., St. Louis 7
Metro Mfg. Co., 38-11 31st St., Long Island City 1, N. Y.
Modern Engrg. Co., Inc., 3401 Pine, St. Louis
Morey Flux & Chem. Co., Wilmington 99, Del.
National Cylinder Gas Co., 205 W. Wacker, Chicago 7
Northeast Metals Co., 4124 Torresdale, Philadelphia 24
Smith Welding Equipment Corp., 2633 Fourth Street, S. E., Minneapolis 14
Special Welding Alloy Co., Inc., 27-33 Jackson, Long Island City, N. Y.
Standard Steel & Wire Co., Bolivar, Pa.
Steel Sales Corp., 3348 S. Pulaski, Chicago 23
Superior Flux Co., 913 Public Square Bldg., Cleveland
Torit Mfg. Co., 270 Walnut St., St. Paul 2
U. S. Steel Supply Co., 1319 Wabansia Ave., Chicago 90
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Welding Alloys Mfg. Co., 744 Broad St., Newark 2
Welding Equip. & Sup. Co., 223 Leib, Detroit
Weldit Acetylene Co., 636 Bagley, Detroit 26
Weldoloy Mfg. Co., 421 Canal St., New York City
York Engineering Co., 3349 W. Ogden Ave., Chicago 23

FLUXES, INCONEL

American Chemical & Flux Co., 95 Lorimer St., Brooklyn 6
American Products Corp., 422 South Dearborn St., Chicago 5
American Solder & Flux Co., 2152 E. Norris St., Philadelphia 25
Anti-Borax Compound Co., 1506 Wall, Ft. Wayne 6, Ind.
Burdett Oxygen Co., 3300 Lakeside Ave., Cleveland 14
Cleanweld Prod. Co., 432 E. 71st St., New York City
Eastern Welding Equipment Co., 17 West 60th St., New York City 23
Eutectic Welding Alloys Co., 40 Worth St., New York City 13
International Nickel Co., Inc., 67 Wall St., New York City 5
Lloyd S. Johnson Co., 2241 Indiana Ave., Chicago
Krembs & Co., 669 W. Ohio St., Chicago 10
Metal Bond Mfg. Co., 3201 Kossuth Ave., St. Louis 7
Morey Flux & Chem. Co., Wilmington 99, Del.
Steel Sales Corp., 3348 S. Pulaski, Chicago 23
Superior Flux Co., 913 Public Square Bldg., Cleveland
Victor Equipment Co., 844-54 Folsom St., San Francisco 7

FLUXES, MAGNESIUM

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
American Magnesium Corp., 1706 Gulf Bldg., Pittsburgh
American Products Corp., 422 South Dearborn St., Chicago 5
American Solder & Flux Co., 2152 E. Norris St., Philadelphia 25
Anti-Borax Compound Co., 1506 Wall, Ft. Wayne 6, Ind.
Burdett Oxygen Co., 3300 Lakeside Ave., Cleveland 14
Croton Chemical Corp., 57 Commercial St., Brooklyn 31
Dow Chemical Co., The, Midland Mich.
Eutectic Welding Alloys Co., 40 Worth St., New York City 13
Metal Bond Mfg. Co., 3201 Kossuth Ave., St. Louis 7
Morey Flux & Chemical Co., Wilmington 99, Del.
Park Stewart, Worthington, Pa.
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Welding Alloys Mfg. Co., 744 Broad St., Newark 2

FLUXES, MONEL

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
American Chemical & Flux Co., 95 Lorimer St., Brooklyn 6
American Products Corp., 422 South Dearborn St., Chicago 5
American Solder & Flux Co., 2152 E. Norris St., Philadelphia 25
Anti-Borax Compound Co., 1506 Wall St., Ft. Wayne 6, Ind.
Burdett Oxygen Co., 3300 Lakeside Ave., Cleveland 14
Cleanweld Prod. Co., 432 E. 71st. St., New York City
Eastern Welding Equipment Co., 17 West 60th St., New York City 23
Eutectic Welding Alloys Co., 40 Worth St., New York City 13
International Nickel Co., Inc., 67 Wall St., New York City 5
Krembs & Co., 669 W. Ohio St., Chicago 10
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
Metal Bond Mfg. Co., 3201 Kossuth Ave., St. Louis 7
Morey Flux & Chemical Co., 1813 Williamson St., Wilmington 99, Del.

FLUXES, MONEL (Cont.)

Special Chemicals Co., 30 Irving Place, New York City
Steel Sales Corp., 3348 S. Pulaski, Chicago 23
Superior Flux Co., 913 Public Square Bldg., Cleveland
Victor Equipment Co., 844-54 Folsom St., San Francisco 7

FUME COLLECTORS & REMOVERS

(See "VENTILATING APPARATUS")

FURNACES, PREHEATING, ANNEALING, STRESS RELIEVING

Ajax Elec. Co., Inc., Philadelphia
Ajax Electrothermic Corp., Trenton 5, N. J.
Despatch Oven Co., 727 Central Ave., Minneapolis
Drever Co., 748 E. Venango St., Philadelphia
Falcon Equipment Company (Successors to H. O. Swoboda, Inc.) 13th St., New Brighton, Pa.
General Electric Co., Schenectady 5, N. Y.
C. I. Hayes, Inc., 75 Baker St., Providence, R. I.
A. F. Holden Co., The, New Haven 8, Conn.
Metal Bond Mfg. Co., 3201 Kossuth Ave., St. Louis 7
R-S Products Corp., 4530 Germantown Ave., Philadelphia
Surface Combustion Co., Toledo, O.
Tate, Jones & Co., Leetsdale, Pa.
Vulcan Corp., 18th & Cherry Sts., Philadelphia 3
Westinghouse Electric and Mfg. Co., East Pittsburgh, Pa.

GALVANIZING COMPOUNDS

American Solder & Flux Co., 2152 E. Norris St., Philadelphia 25
Eutectic Welding Alloys Co., 40 Worth St., New York City 13
Galv-Weld, Inc., 314 First St., Dayton, O.
Lloyd S. Johnson Co., 2241 Indiana Ave., Chicago
Victor Equipment Co., 844-54 Folsom St., San Francisco 7

GAMMA-RAY EQUIPMENT

Canadian Radium & Uranium Corp., 630 Fifth Ave., New York City 20
Eastman Kodak Co., X-Ray Div., Rochester 4
Radium Chemical Co., Inc., 570 Lexington Ave., New York City 22

GAS-SAVING DEVICES

Harris Calorific Co., 5501 Cass Ave., Cleveland 2
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago 7
Safety Shock Mfg. Co., Fowler, Calif.
Superior Oxy-Acetylene Mach. Co., 1102 High St., Hamilton, O.
Universal Power Corp., 4899 Euclid Ave., Cleveland 3
Weldit Acetylene Co., 636 Bagley, Detroit 26

GAUGES, OXYGEN & ACETYLENE

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Bastian-Blessing Co., 4201 Peterson Ave., Chicago 30
Burdett Oxygen Co., 3300 Lakeside Ave., Cleveland 14
Craftsweld Equipment Corp., 2626 Jackson Ave., Long Island City 1, N. Y.
Dockson Corp., 3839 Wabash, Detroit 8
Electric Auto-Lite Co., Moto Meter Gauge & Equip. Div., Chrysler Bldg, New York City
General Welding & Equip. Co., 268 Northampton St., Boston 18
Harris Calorific Co., 5501 Cass Ave., Cleveland 2
Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago
K-G Welding & Cutting Co., Inc., 515 W. 29th St., New York City
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
Liquid Carbonic Corp., Wall Chemicals Div., 3100 S. Kedzie Ave., Chicago 23
Metallizing Company of America, 1330 W. Congress St., Chicago 7
Metro Mfg. Co., 38-11 31st St., Long Island City 1, N. Y.
Alexander Milburn Co., 1416 W. Baltimore St., Baltimore 23
Modern Engineering Co., Inc., 3401 Pine, St. Louis, Mo.
J. Nageldinger & Son, Inc., 409 East 91st St., New York City 28
National Cylinder Gas Co., 205 W. Wacker, Chicago 7
Smith Welding Equipment Corp., 2633 Fourth St., S.E., Minneapolis
Superior Oxy-Acetylene Mach. Co., 1102 High St., Hamilton, O.
U. S. Gauge Co., 14 Wall St., New York City
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Weldit Acetylene Co., 636 Bagley, Detroit 26

GAUGES, WELD

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Chicago Tool & Engrg. Co., 8383 So. Chicago Ave., Chicago 17
General Electric Co., Schenectady 5
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
Modern Engrg. Co., Inc., 3401 Pine, St. Louis
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago
Superior Oxy-Acetylene Mach. Co., 1102 High St., Hamilton, O.
Weldit Acetylene Co., 636 Bagley, Detroit 26
Westinghouse Elec. & Mfg. Co., E. Pittsburgh

GENERATORS, ACETYLENE

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Harris Calorific Co., 5501 Cass Ave., Cleveland 2
Independent Engineering Co., 117 W. 2nd St., O'Fallon, Ill.
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
Marquette Mfg. Co., Inc., 307 E. Hennepin, Minneapolis 14
Modern Engrg. Co., Inc., 3401 Pine, St. Louis
National Cylinder Gas Co., 205 W. Wacker, Chicago 7
Sight Feed Generator Co., 14 No. 10th St., Richmond, Ind.
Smith Welding Equipment Corp., 2633 Fourth Street, S. E., Minneapolis 14
Superior Oxy-Acetylene Mach. Co., 1102 High St., Hamilton, O.
Victor Equipment Co., 844-54 Folsom St., San Francisco 7

GENERATORS, D-C

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Allis-Chalmers Mfg. Co., Milwaukee 1
Century Electric Co., 1806 Pine St., St. Louis 3
Couse Laboratories, 300 Passaic St., Newark
Electric Arc, Inc., 152 Jelliff Ave., Newark
General Electric Co., Schenectady 5, N. Y.
Hobart Bros. Co., Troy 1, O.
LeJay Mfg. Co., 2900 Emerson Ave., S., Minneapolis
Lincoln Electric Co., 12818 Coit Rd., Cleveland 1
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago 7
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Westinghouse Elec. & Mfg. Co., E. Pittsburgh

GENERATORS, HYDROGEN

General Electric Co., Schenectady 5, N. Y.
Girdler Corp., The, Louisville
Independent Engineering Co., 117 W. 2nd St., O'Fallon, Ill.
Modern Engineering Co., Inc., 3401 Pine, St. Louis

GLASS, HEAT-RESISTANT

Corning Glass Works, Corning, N. Y.
Semon Bache & Co., Greenwich and Morton Streets, New York City

GLOVES, WELDING

Advance Glove Mfg. Co., 901 W. Lafayette Ct., Detroit
Air Reduction Sales Co., 60 E. 42nd St., New York City 17
American Industrial Safety Equipment, Inc., 397 Bridge St., Brooklyn 1
American Optical Co., 16 Mechanic St., Southbridge, Mass.
Armstrong Supply Co., 1618 No. Broad St., Philadelphia 21
Asbestos Fibre Spinning Co., North Wales, Pa.
B & H Welders Supplies, 403 Fourth St., Portsmouth, Va.
Boss Mfg. Co., Kewanee, Ill.
Boston Athletic Shoe Co., 25 Thorndike St., Cambridge 41, Mass.
Boyer-Campbell Co., 6540 Antoine St., Detroit
Candor Glove Co., Candor, N. Y.
Davis Emergency Equip. Co., Inc., 45 Halleck St., Newark 4
Eastern Equipment Co., Inc., Willow Grove, Pa.
Eastern Safety Clothing Co., 23 W. 60th St., New York City 23
Ergolyte Mfg. Co., 3627 N. Lawrence St., Philadelphia 40
Fibre-Metal Prod. Co., The, 5th and Tilghman St., Chester, Pa.
General Electric Co., Schenectady 5, N. Y.
Hammond, Howard S. Co., Suite 3022 Empire State Bldg., New York 1
Hanover Glove Co., Hanover, Pa.
Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago
Industrial Gloves Co., Danville, Ill.
Industrial Prod. Co., 2820 N. 4th St., Philadelphia 33
Fred Jessar, 404 Denckla Bldg., Philadelphia 7
Kimball Safety Prod. Co., 7314 Wade Park Ave., Cleveland 3
Kriewaldt Specialty Mfg. Co., Oconto, Wis.
Larkin Lectro Prod. Co., 220 Teaffe Pl., Brooklyn 5
Lincoln Electric Co., 12818 Coit Rd., Cleveland 1
Linde Air Products Co., 30 E. 42nd St., New York City 17
Liquid Carbonic Corp., Wall Chemicals Div., 3100 S. Kedzie Ave., Chicago 23
Metallizing Company of America, 1330 W. Congress St., Chicago 7
Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh, Pa.
Modern Engrg. Co., Inc., 3401 Pine, St. Louis
Montpelier Glove Co., Montpelier, Ind.
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago 7
Parker Safety Equip. Co., 785 Lyons Ave., Irvington, N. J.
Pulmosan Safety Equip. Corp., 176 Johnson St., Brooklyn 1
Rabin Glove Co., 407 Grove St., Jersey City, N. J.
Rail Supply Co., 110 E. 42nd St., New York City 17
Safety Clothing & Equip. Co., 7016 Euclid, Cleveland
Sellstrom Mfg. Co., 615 N. Aberdeen St., Chicago 22
Singer Leather Clothing Co., 129 No. 12th St., Philadelphia
Steel Sales Corp., 3348 S. Pulaski, Chicago 23
E. J. Streichert, 1747 N. Pulaski, Chicago
Superior Oxy-Acetylene Mach. Co., 1102 High St., Hamilton, O.
Trindl Products Ltd., 17 E. 23rd St., Chicago 16
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Weldit Acetylene Co., 638 Bagley Ave., Detroit 26
Westinghouse Electric & Mfg. Co., E. Pittsburgh

GOGGLES, WELDING

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
American Allsafe Company, Inc., 1245 Niagara St., Buffalo 13, N. Y.
American Optical Co., 16 Mechanic St., Southbridge, Mass.
Bastian-Blessing Co., 4201 Peterson Ave., Chicago 30
Harry Buegeleisen, Inc., 181 Pacific St., Brooklyn
Burdett Oxygen Co., 3300 Lakeside Ave., Cleveland 14
Carter Lockard Co., 225 W. 11th St., Los Angeles 15
Chicago Eye Shield Co., 2300 Warren Blvd., Chicago 12
Craftsweld Equipment Corp., 2626 Jackson Ave., Long Island City 1, N. Y.
Davis Emergency Equip. Co., Inc., 45 Halleck St., Newark 4
Dockson Corp., 3839 Wabash, Detroit 8
Eastern Equipment Co., Inc., Willow Grove, Pa.
Eastern Safety Clothing Co., 23 W. 60th St., New York City 23
General Electric Co., Schenectady 5, N. Y.
General Scientific Equip. Co., 1346 W. Somerset St., Philadelphia 32
Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago
Industrial Prod. Co., 2820 N. 4th St., Philadelphia 33
Kimball Safety Prod. Co., 7314 Wade Park Ave., Cleveland 3
Lincoln Electric Co., 12818 Coit Rd., Cleveland 1
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
Liquid Carbonic Corp., Wall Chemicals Div., 3100 S. Kedzie Ave., Chicago 23
Metal Bond Mfg. Co., 3201 Kossuth Ave., St. Louis 7
Metro Mfg. Co., 93-04 150th St., Jamaica 2, N. Y.
Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh
Modern Engineering Co., Inc., 3401 Pine Blvd., St. Louis
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago 7
Parker Safety Equip. Co., 785 Lyons St., Irvington, N. J.
Pulmosan Safety Equip. Corp., 176 Johnson St., Brooklyn 1
Rail Supply Co., 110 E. 42nd St., New York City 17
Sellstrom Mfg. Co., 615 N. Aberdeen St., Chicago 22
Special Welding Alloy Co., Inc., 27-33 Jackson, Long Island City, N. Y.
Standard Safety Equip. Co., 232 W. Ontario, Chicago 10
Superior Oxy-Acetylene Mach. Co., 1102 High St., Hamilton, O.
Trindl Products, Ltd., 17 E. 23rd St., Chicago 16
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Watchemoket Optical Co., Inc., Providence 3
Welding Alloys Mfg. Co., 744 Broad St., Newark
Welsh Mfg. Co., 58 Troy St., Providence 9, R. I.
Willson Products, Inc., 2nd and Washington Sts., Reading, Pa.

GOVERNORS, GAS ENGINE

Air Reduction Sales, 60 E. 42nd St., New York City 17
Electric Arc, Inc., 152 Jelliff Ave., Newark
Lincoln Electric Co., 12818 Coit Rd., Cleveland 1
Pierce Governor Co., Inc., The, 1607 Ohio Ave., Anderson, Ind.
Westinghouse Electric & Mfg. Co., E. Pittsburgh
Wilson Welder & Metals Co. Inc., 60 E. 42nd St., New York City 17

GRINDERS, ABRASIVE BELT

Divine Brothers Co., 102 Whitesboro St., Utica 1, N. Y.
Fox Grinders, Inc., Oliver Bldg., Pittsburgh
Jones Engineering Company, 523 Spring Street, Elwood City, Pa.
Porter-Cable Machine Co., 1714 N. Salina St., Syracuse 8
U. S. Steel Supply Co., 1319 Wabansia, Chicago 90
Walls Sales Corp., 96 Warren St., New York City 7

GRINDERS, ELECTRIC BENCH & PEDESTAL

Black & Decker Mfg. Co., The, Towson 4, Md.
Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chicago 6
Skilsaw, Inc., 4763 Winnemac Ave., Chicago 30
A. O. Smith Corp., 27th & Hopkins, Milwaukee

GRINDERS, BENCH & PEDESTAL (Cont.)

Stanley Elec. Tool Div., 177 Elm St., New Britain, Conn.
Steody Co., 1135 W. Slauson Ave., Whittier, Calif.
Stow Mfg. Co., 443 State St., Binghamton, N. Y.
U. S. Steel Supply Co, 1319 Wabansia Ave., Chicago 90
Wells Sales Corp., 96 Warren St., New York City
Wyzenbeek and Staff, Inc., 838 W. Hubbard St., Chicago

GRINDERS, PORTABLE ELECTRIC

Albertson Co., Sioux City, Ia.
Black & Decker Mfg. Co., The, Towson 4, Md.
Buckeye Tools Corp., 29 W. Apple St., Dayton, O.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York City
Gaston Power Tools, 2657 W. 95th St., Chicago 42
Independent Pneum. Tool Co., 600 W. Jackson Blvd., Chicago 6
K. O. Lee Co., Aberdeen, S. D.
Mall Tool Company, 7740 South Chicago Ave., Chicago 19
Rotor Tool Co., 17325 Euclid Ave., Cleveland
Skilsaw, Inc., 4763 Winnemac Ave., Chicago 30
Stanley Elec. Tool Div., 177 Elm St., New Britain, Conn.
Steody Co., 1135 W. Slauson Ave., Whittier, Calif.
Stow Mfg. Co., 443 State St., Binghamton, N. Y.
U. S. Steel Supply Co., 1319 Wabansia Ave., Chicago 90
Wodack Electric Tool Corp., 4627 W. Huron, Chicago

GRINDERS, PORTABLE PNEUMATIC

Abrasive Products Inc., So. Braintree, Mass.
Buckeye Tools Corp., 29 W. Apple St., Dayton, O.
Chicago Pneumatic Tool Co., 6 East 44th St., New York City
Cleveland Pneum. Tool Co., 3781 E. 7th St., Cleveland
Independent Pneum. Tool Co., 600 W. Jackson Blvd., Chicago 6
Chas. F. Overly Co., 1753 Rosedale Ave., Cleveland 12
Rotor Tool Co., 17325 Euclid Ave., Cleveland

GRINDING WHEELS

Abrasive Products Inc., South Braintree, Mass.
Bay State Abrasive Prod. Co., 12 Union St., Westboro, Mass.
Carborundum Co., Niagara Falls, N. Y.
Chicago Wheel & Mfg. Co., 1101 W. Monroe St., Chicago 7
Cleveland Pneum. Tool Co., 371 E. 77th St., Cleveland
Cortland Grinding Wheels Corp., 15 Cortland St., Chester, Mass.
Fibre Abrasive Corp., 1129 E. 74th St., Chicago
Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chicago 6
K. O. Lee Co., Aberdeen, S. D.
Macklin Co., Jackson, Mich.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Safety Grinding Wheel Co., 2258 Columbus Ave., Springfield, O.
Simonds, Worden White Co., 1101 Negley Place, Dayton, O.
Sterling Grinding Wheel Co., Tiffin, O.

GROUND CLAMPS

(See "CLAMPS, GROUND")

GUARDS, FINGER

American Optical Co., 16 Mechanic St., Southbridge, Mass.
Industrial Gloves Co., Danville, Ill.
Victor Equipment Co., 844-54 Folsom St., San Francisco 7

GUNS, SPOT-WELDING

Acme Elec. Welder Co., 2618 Fruitland Rd., Los Angeles 11
Acro Welder Mfg. Co., Inc., 1825 W. St. Paul Ave., Milwaukee 3
Agnew Electric Co., Milford, Mich.
Eisler Engineering Co., 749 S. 13th St., Newark 3
Federal Mach. & Welder Co., 212 Dana St., Warren, O.
Progressive Welder Co., 3050 E. Outer Dr., Detroit 12
Sciaky Bros., 4915 W. 67th St., Chicago 38
Taylor-Winfield Corp., Warren, O.
Thomson-Gibb Electric Welding Co., 161 Pleasant St., Lynn, Mass.
Universal Power Corp., 4899 Euclid Ave., Cleveland 3
Welding Machines Mfg. Co., 17325 Lamont Ave., Detroit 12

HAMMERS

Atlas Welding Accessories Co., 14820 Wyoming Ave., Detroit 21
Black & Decker Mfg. Co., The, Towson 4, Md.
Bonney Forge & Tool Works, Tilghman St., Allentown, Pa.
Carter Lockard Co., 225 W. 11th St., Los Angeles 15, Calif.
Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9
Dallett Co., The, Mascher at Lippincott St., Philadelphia 33
Independent Pneum. Tool Co., 600 W. Jackson Blvd., Chicago 6
Chas. F. Overly Co., 1753 Rosedale Ave., Cleveland 12, O.
St. Pierre Chain Corp., Frank St., Worcester, Mass.
Stanley Elec. Tool Div., 17 Elm St., New Britain, Conn.

HAMMERS, WELD IDENTIFICATION

Atlas Welding Accessories Co., 14820 Wyoming Ave., Detroit 21
Universal Power Corp., 4899 Euclid, Cleveland 3

HARD-FACING MATERIALS

(See "ELECTRODES, HARD-FACING" and "WELDING ROD, HARD-FACING")

HEADS, AUTOMATIC ARC

(See "ARC WELDERS, AUTOMATIC")

HELMETS, ARC-WELDING

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
American Agile Corp., 5806 Hough Ave., Cleveland
American Industrial Safety Equipment, Inc., 397 Bridge St., Brooklyn 1
American Optical Co., Southbridge, Mass.
B & H Welders Supplies, 403 Fourth St., Portsmouth, Va.
Boyer-Campbell Co., 6540 Antoine St., Detroit
Chicago Eye Shield Co., 2300 Warren Blvd., Chicago 12
Davis Emergency Equip. Co., Inc., 45 Halleck St., Newark 4
Dockson Corporation, 3839 Wabash Ave., Detroit 8
Eastern Equipment Co., Inc., Willow Grove, Pa.
Eastern Safety Clothing Co., 23 W. 60th St., New York City 23
Eisler Engineering Co., 749 S. 13th St., Newark 3
Electric Arc, Inc., 152 Jolliff Ave., Newark, N. J.
Ergolyte Mfg. Co., 3627 N. Lawrence St., Philadelphia 40
Fibre-Metal Prod. Co., The, 5th and Tilghman St., Chester, Pa.
Flood Safety Prod. Co., 4027 N. Drake St., Chicago
General Electric Co., Schenectady 5, N. Y.
General Scientific Equip. Co., 1346 W. Somerset St., Philadelphia 32
Hobart Brothers Co., Troy 1, O.
Industrial Prod. Co., 2820 N. 4th St., Philadelphia
Kimball Safety Prod. Co., 7314 Wade Park Ave., Cleveland 3
Larkin Lectro Products Co., 220 Taaffe Place, Brooklyn 5
K. O. Lee Co., Aberdeen, S. D.
Lincoln Electric Co., 12818 Coit Rd., Cleveland 1
Marquette Mfg. Co., Inc., 307 E. Hennepin St., Minneapolis 14
Metro Mfg. Co., 38-11 31st St., Long Island City 1, N. Y.
Mine Safety Appliances Co., Braddock, Thomas & Meade Sts., Pittsburgh
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago 7
Parker Safety Equip. Co., 785 Lyons Ave., Irvington, N. J.
Pulmosan Safety Equip. Corp., 176 Johnson St., Brooklyn 1
Rail Supply Co., 110 E. 42nd St., New York City 17
Sellstrom Mfg. Co., 615 N. Aberdeen St., Chicago 22
Steel Sales Corp., 3348 S. Pulaski, Chicago 23
Superior Oxy-Acetylene Mach. Co., 1102 High St., Hamilton, O.
Trindl Products, Ltd., 17 E. 23rd St., Chicago 16
U. S. Steel Supply Co., 1319 Wabansia Ave., Chicago 90
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Welding Alloys Mfg. Co., 744 Broad St., Newark
Welding Apparatus Company, 2750 W. Van Buren St., Chicago 12, Ill.
Welding Engineering Co., 264 E. Ogden, Milwaukee 2
Weldit Acetylene Co., 636 Bagley, Detroit 26
Welsh Mfg. Co., 58 Troy St., Providence 9, R. I.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh
Willson Products, Inc., 2nd and Washington Sts., Reading, Pa.
Wilson Welder & Metals Co., Inc., 60 E. 42nd St., New York City 17

HOLDERS, CARBON ELECTRODE

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Albert & J. M. Anderson Mfg. Co., 289 A Street, Boston 10
Eisler Engineering Co., 749 S. 13th St., Newark 3
Fibre-Metal Prod. Co., The, 5th and Tilghman Sts., Chester, Pa.
General Electric Co., Schenectady 5, N. Y.
Hammett Elec. Mfg. Co., 209 W. 19th Terrace, Kansas City, Mo.
Hobart Bros. Co., Troy 1, O.
Lincoln Electric Co., 12818 Coit Rd., Cleveland 1
Marquette Mfg. Co., Inc., 307 E. Hennepin St., Minneapolis 14
National Cylinder Gas Co, 205 W. Wacker Drive Chicago 7
Trindl Prod. Ltd., 17 E. 23rd St., Chicago 16
Tweco Products Co., English at Ida, Wichita 7, Kans.
Westinghouse Electric and Mfg. Co., East Pittsburgh, Pa.

HOLDERS, ELECTRODE

(See "ELECTRODE HOLDERS" and "HOLDERS, CARBON ELECTRODE")

HOSE, WELDING & CUTTING

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Burdett Oxygen Co., 3300 Lakeside Ave., Cleveland 14
Dockson Corporation, 3839 Wabash Ave., Detroit 8
Eastern Welding Equipment Co., 17 West 60th St., New York City 23
Electric Hose & Rubber Co., Wilmington, Del.
B. F. Goodrich Co., Akron, O.
Goodyear Tire & Rubber Co., Inc., Akron, O.
Hewitt Rubber Corporation, 240 Kensington Ave., Buffalo 5, N. Y.
Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago
Liquid Carbonic Corp., Wall Chemicals Div., 3100 S. Kedzie Ave., Chicago 23
Linde Air Prod. Co., 30 E. 42nd St., New York City 17
Modern Engineering Co., Inc., 3401 Pine Blvd., St. Louis
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago 7
Quaker Rubber Corporation, Philadelphia 24, Pa.
Republic Rubber Co., Youngstown, O.
Superior Oxy-Acetylene Mach. Co., 1102 High St., Hamilton, O.
Universal Power Corp., 4899 Euclid Ave., Cleveland 3
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Welding Engineering Co., 264 E. Ogden, Milwaukee 2
Weldit Acetylene Co., 638 Bagley Ave., Detroit 26

HYDROGEN, BOTTLED

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Burdett Oxygen Co., 3300 Lakeside Ave., Cleveland 14
Independent Engineering Company, O'Fallon, Ill.
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
Liquid Carbonic Corp., Wall Chemicals Div., 3100 S. Kedzie Ave., Chicago 23
Modern Engineering Co., Inc., 3401 Pine, St. Louis

INDUCTION HEATERS

General Electric Co., Schenectady 5, N. Y.
Induction Heating Corp., 389 Lafayette, New York City 31
Westinghouse Electric and Mfg. Co., East Pittsburgh

INSPECTION EQUIPMENT, WELD

(See also "X-RAY EQUIPMENT")

Atlas Welding Accessories Co., 14824 Wyoming Ave., Detroit 21
Fibre-Metal Prod. Co., 5th and Tilghman St., Chester, Pa.
Magnaflux Corp., 5908 N. Northwest Highway, Chicago
Rubicon Company, Ridge Ave. at 35th St., Philadelphia

INSTRUMENTS, TRAINING AIDS

Rubicon Company, Ridge Ave. at 35th St., Philadelphia
A. O. Smith Corp., 27th and Hopkins, Milwaukee

JACKS, LIFTING

Duff-Norton Mfg. Co., The, Pittsburgh
Templeton, Kenly & Co., 1020 S. Central Ave., Chicago 44

JIGS, PIPE WELDING

Electric Arc, Inc., 152 Jolliff Ave., Newark
Jewell Mfg. Co., 1841 University Ave., St. Paul
Nelsonville Fdry. & Mach. Co., 1021-81 Chestnut St., Nelsonville, O.
Welding Machines Mfg. Co., 17325 Lamont Ave., Detroit

LEAD-WELDING EQUIPMENT

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Craftsweld Equip. Corp., 2626 Jackson Ave., Long Island City, N. Y.
General Electric Co., Schenectady 5, N. Y.
General Welding & Equip. Co., 268 Northampton St., Boston 18
Harris Calorific Co., 5501 Cass Ave., Cleveland 2
Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago
Insto-Gas Corp., 1900 E. Jefferson Ave., Detroit
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
Modern Engineering Co., Inc., 3401 Pine Blvd., St. Louis
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago 7
Rail Supply Co., 110 E. 42nd St., New York City 17
Smith Welding Equipment Corp., 2633 Fourth Street, SE, Minneapolis
Superior Oxy-Acetylene Mach. Co., 1102 High St., Hamilton, O.
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Welders Supply & Mfg. Co., 108 W. Central Parkway, Cincinnati
Weldit Acetylene Co., 636 Bagley, Detroit 26

LEATHER, WELDORS'

American Optical Co., 16 Mechanic St., Southbridge, Mass.
Boyer-Campbell Co., 6540 Antoine St., Detroit
Colonial Tanning Co., 622 W. Oregon St., Milwaukee

LEATHER, WELDORS' (Cont.)

Eastern Safety Clothing Co., 23 W. 60th St., New York City 23
Eastern Welding Equipment Co., 17 W. 60th St., New York City 23
Ergolyte Mfg. Co., 3627 N. Lawrence St., Philadelphia 40
Fibre-Metal Prod. Co., The, 5th and Tilghman St., Chester, Pa.
General Electric Co., Schenectady 5, N. Y.
Industrial Gloves Co., Danville, Ill.
Kimball Safety Prod. Co., 7314 Wade Park Ave., Cleveland
Korn Leather Co., Peabody, Mass.
J. Lichtman & Sons, 241 Frelinghuysen Ave., Newark 5
Pulmosan Safety Equipment Corp., 176 Johnson St., Brooklyn 1
S. C. Leather Co., 819 Fifth Ave., Pittsburgh 19
Safety Clothing & Equipment Co., 7016 Euclid, Cleveland
Superior Oxy-Acetylene Mach. Co., 1102 High St., Hamilton, O.
Victor Equipment Co., 844-54 Folsom St., San Francisco 7

LENS CLEANER

American Agile Corp., 5806 Hough Ave., Cleveland
American Optical Co., 16 Mechanic St., Southbridge, Mass.
Eastern Welding Equipment Co., 17 W. 60th St., New York City 23
Industrial Prod. Co., 2820 N. 4th St., Philadelphia 33
Oakite Products, Inc., 23 Thames St., New York City 6
Pulmosan Safety Equipment Corp., 176 Johnson St., Brooklyn 1
Sellstrom Mfg. Co., 615 N. Aberdeen St., Chicago 22
Victor Equipment Co., 844-54 Folsom St., San Francisco 7

LENS PROTECTOR

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
American Industrial Safety Equipment, Inc., 397 Bridge St., Brooklyn 1
American Optical Co., 16 Mechanic St., Southbridge, Mass.
Harry Buegeleisen, Inc., 181 Pacific St., Brooklyn
L. H. Bullock Co., Berkeley, Calif.
Eastern Equipment Co., Inc., Willow Grove, Pa.
Eastern Welding Equipment Co., 17 W. 60th St., New York City 23
Electric Arc, Inc., 152 Jelliff Ave., Newark
F. R. Faulk, 405 Pennsylvania Ave., Pittsburgh
General Electric Co., Schenectady 5, N. Y.
Hopkins Engineering Co., 230 N. Michigan, Chicago 1
Kimball Safety Prod. Co., 7314 Wade Park Ave., Cleveland 3
Mine Safety App. Co., Pittsburgh
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago 7
Parker Safety Equipment Co., 785 Lyons Ave., Irvington, N. J.
Pulmosan Safety Equipment Corp., 176 Johnson St., Brooklyn 1
Sellstrom Mfg. Co., 615 N. Aberdeen St., Chicago 22
Superior Oxy-Acetylene Mach. Co., 1102 High St., Hamilton, O.
Welding Alloys Mfg. Co., 744 Broad St., Newark
Willson Products, Inc., 2nd and Washington Sts., Reading, Pa.
Wilson Welder & Metals Co., Inc., 60 E. 42nd St., New York City 17

LENSES, COVER

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
American Agile Corp., 5806 Hough Ave., Cleveland
American Industrial Safety Equipment, Inc., 397 Bridge St., Brooklyn 1
American Optical Co., 16 Mechanic St., Southbridge, Mass.
Boyer-Campbell Co., 6540 Antoine St., Detroit
Harry Buegeleisen, Inc., 181 Pacific St., Brooklyn
L. H. Bullock Co., Berkeley, Calif.
Burdett Oxygen Co., 3300 Lakeside Ave., Cleveland 14
Carter-Lockard Co., 225 W. 11th St., Los Angeles 15
Central Steel & Wire Co., 3000 W. 51st St., Chicago 80
Chicago Eye Shield Co., 2300 Warren Blvd., Chicago 12
Davis Emergency Equip. Co., Inc., 45 Halleck St., Newark 4
Dockson Corp., 3839 Wabash, Detroit 8
Eastern Equipment Co., Inc., Willow Grove, Pa.
Eastern Safety Clothing Co., 23 W. 60th St., New York City 23
Eastern Welding Equipment Co., 17 W. 60th St., New York City 23
Electric Arc, Inc., 152 Jelliff Ave., Newark
Ergolyte Mfg. Co., 3627 N. Lawrence St., Philadelphia 40
F. R. Faulk, 405 Pennsylvania Ave., Pittsburgh 22
Fibre-Metal Prod. Co., The, 5th and Tilghman St., Chester, Pa.
Fish-Schurman Corp., 230 E. 45th St., New York City 17
General Electric Co., Schenectady 5, N. Y.
General Scientific Equip. Co., 1346 W. Somerset St., Philadelphia 32
Hopkins Engineering Co., 230 N. Michigan Ave., Chicago 1
Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago
Industrial Prod. Co., 2820 N. 4th St., Philadelphia 33
Kimball Safety Prod Co., 7314 Wade Park Ave., Cleveland 3
Larkin Lectro Products, 220 Taaffe Place, Brooklyn 5
Liquid Carbonic Corp., Wall Chemicals Div., 3100 S. Kedzie Ave., Chicago 23
Lincoln Electric Co., 12818 Coit Rd., Cleveland 1
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
Marquette Mfg. Co., Inc., 307 E. Hennepin St., Minneapolis 14
McDonald Co., 1248-M South Hope St., Los Angeles 15
Metal Bond Mfg. Co., 3201 Kossuth Ave., St. Louis 7
Metro Mfg. Co., 38-11 31st St., Long Island City 1, N. Y.
Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh
Northeast Metals Co., 4124 Torresdale Ave., Philadelphia 24
Parker Safety Equipment Co., 785 Lyons St., Irvington, N. J.
Pulmosan Safety Equip. Corp., 176 Johnson St., Brooklyn 1
Rail Supply Co., 110 E. 42nd St., New York City 17
Sellstrom Mfg. Co., 615 N. Aberdeen St., Chicago 22
F. W. Shrader Co., 5788 Washington, Culver City, Calif.
Steel Sales Corp., 3348 S. Pulaski, Chicago 23
Superior Oxy-Acetylene Mach. Co., 1102 High St., Hamilton, O
Thermacote Co., 120 Arlington St., Newark 2
Trindl Products Ltd., 17 E. 23rd St., Chicago 16
Una Welding, Inc., 1615 Collamer Ave., Cleveland 10
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Welding Alloys Mfg. Co., 744 Broad St., Newark 2
Welsh Mfg. Co., 58 Troy St., Providence 9, R. I.
Westinghouse Electric and Mfg. Co., East Pittsburgh, Pa.
Willson Products, Inc., 2nd & Washington Sts., Reading, Pa.
Wilson Welder & Metals Co., Inc., 60 E. 42nd St., New York City 17

LENSES, WELDING

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
American Agile Corp., 5806 Hough Ave., Cleveland
American Industrial Safety Equipment, Inc., 397 Bridge St., Brooklyn 1
American Optical Co., 16 Mechanic St., Southbridge, Mass.
B & H Welders Supplies, 403 Fourth Street, Portsmouth, Va.
Boyer-Campbell Co., 6540 Antoine St., Detroit
Harry Buegeleisen, Inc., 181 Pacific St., Brooklyn, N. Y.
Burdett Oxygen Co., 3300 Lakeside Ave., Cleveland 14
Central Steel & Wire Co., 3000 W. 51st St., Chicago 80
Chicago Eye Shield Co., 2300 Warren Blvd., Chicago 12
Craftsweld Equipment Corp., 2626 Jackson Ave., Long Island City 1, N. Y.
Davis Emergency Equip. Co., Inc., 45 Halleck St., Newark 4
Dockson Corp., 3839 Wabash, Detroit 8
Eastern Equipment Co., Inc., Willow Grove, Pa.
Eastern Safety Clothing Co., 23 W. 60th St., New York City 23
Eastern Welding Equipment Co., 17 W. 60th Street, New York City 23
Electric Arc, Inc., 152 Jelliff Ave., Newark
Ergolyte Mfg. Co., 3627 N. Lawrence St., Philadelphia 40
Fibre-Metal Prod. Co., 5th and Tilghman St., Chester, Pa.
Fish-Schurman Corp., 230 E. 45th St., New York City 17
General Electric Co., Schenectady 5, N. Y.
General Scientific Equip. Co., 1346 W. Somerset St., Philadelphia 32
Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago
Industrial Prod. Co., 2820 N. 4th St., Philadelphia 33
Kimball Safety Prod. Co., 7314 Wade Park Ave., Cleveland 3
Larkin Lectro Products, 220 Taaffe Place, Brooklyn 5
Lincoln Electric Co., 12818 Coit Rd., Cleveland 1
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
Liquid Carbonic Corp., Wall Chemicals Div., 3100 S. Kedzie Ave., Chicago 23
Marquette Mfg. Co., Inc., 307 E. Hennepin St., Minneapolis 14
McDonald Co., 1248-M South Hope St., Los Angeles 15
Metal Bond Mfg. Co., 3201 Kossuth Ave., St. Louis 7
Metro Mfg. Co., 38-11 31st St., Long Island City 1, N. Y.
Modern Engineering Co., Inc., 3401 Pine Blvd., St. Louis
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago 7
Parker Safety Equipment Co., 785 Lyons St., Irvington, N. J.
Pulmosan Safety Equipment Corp., 176 Johnson St., Brooklyn 1
Rail Supply Co., 110 E. 42nd St., New York City 17
Sellstrom Mfg. Co., 615 N. Aberdeen St., Chicago 22
Special Welding Alloys Co., Inc., 27-26 Jackson, Long Island City, N. Y.
Steel Sales Corp., 3348 S. Pulaski, Chicago 23
Superior Oxy-Acetylene Mach. Co., 1102 High St., Hamilton, O.
U. S. Steel Supply Co., 1319 Wabansia Ave., Chicago 90
Univis Lens Co., 401 Leo St., Dayton, O.
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Welding Alloys Mfg. Co., 744 Broad St., Newark 2
Weldit Acetylene Co., 636 Bagley, Detroit
Welsh Mfg. Co., 58 Troy St., Providence 9, R. I.
Westinghouse Electric and Mfg. Co., East Pittsburgh, Pa.
Willson Products, Inc., 2nd and Washington Sts., Reading, Pa.
Wilson Welder & Metals Co., Inc., 60 E. 42nd St., New York City 17

LIGHTERS, TORCH

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Burdett Oxygen Co., 3300 Lakeside Ave., Cleveland 14
Central Steel & Wire Co., 3000 W. 51st St., Chicago 80
Dockson Corp., 3839 Wabash, Detroit 8
Eastern Welding Equipment Co., 17 West 60th St., New York City 23
Eisler Engr. Co., Inc., 749 S. 13th St., Newark 3
Flint Products Co., The, 2925 Ave. H, Brooklyn 10, N. Y.
G. C. Fuller Mfg. Co., 1621 Central Ave., Cincinnati 14
General Scientific Equip. Co., 1346 W. Somerset St., Philadelphia
Hammett Electric Mfg. Co., 2858 McGee St., Kansas City, Mo.
Harris Calorific Sales Co. of N. Y., 136 Liberty Street, New York City
Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago
Industrial Prod. Co., 2820 N. 4th St., Philadelphia
Larkin Lectro Products Co., 220 Taaffe Pl., Brooklyn 5
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
Liquid Carbonic Corp., Wall Chemicals Div., 3100 S. Kedzie Ave., Chicago 23
Metal Bond Mfg. Co., 3201 Kossuth Ave., St. Louis 7
Modern Engineering Co., Inc., 3401 Pine Blvd., St. Louis
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago 7
Rail Supply Co., 110 E. 42nd St., New York City 17
Safety Gas Lighter Co., Lynn, Mass.
Shoot-A-Lite Corp., 118 E. 28th St., New York City
Smith Welding Equipment Corp., 2633 Fourth Sreet, S. E., Minneapolis 14
Superior Oxy-Acetylene Mach. Co., 1102 High St., Hamilton, O.
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Weldit Acetylene Co., 636 Bagley, Detroit 26

LIGHTS, CARBIDE

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
Alexander Milburn Co., 1416 W. Baltimore St., Baltimore 23
Modern Engineering Co., Inc., 3401 Pine Blvd., St. Louis
National Carbide Corp., 60 E. 42nd St., New York City 17

LOW-TEMPERATURE ALLOYS

Central Steel & Wire Co., 3000 W. 51st St., Chicago 80
Chase Brass & Copper Co., Inc., 238 Grand St., Waterbury, Conn.
Eutectic Welding Alloys Co., 40 Worth St., New York City 13
Handy & Harman, 82 Fulton St., New York City 7
Krembs & Co., 669 W. Ohio St., Chicago 10
C. E. Phillips & Company, 2750 Poplar St., Detroit 8
Special Welding Alloy Co., Inc., 27-33 Jackson, Long Island City, N. Y.
Steel Sales Corp., 3348 S. Pulaski, Chicago 23
Titan Metal Mfg. Co., Bellefonte, Pa.

LUGS, WELDING CABLE

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Albert & J. M. Anderson Mfg. Co., 289 A St., Boston 10
Burndy Engineering Co., Inc., 107 Eastern Blvd., New York City 54
Burdett Oxygen Co., 3300 Lakeside Ave., Cleveland 14
Chicago Tool & Engineering Co., 8383 So. Chicago Ave., Chicago
Fibre-Metal Prod. Co., The, 5th and Tilghman St., Chester, Pa.
General Electric Co., Schenectady 5, N. Y.
Larkin Lectro Products Co., 220 Taaffe Place, Brooklyn 5
Lincoln Electric Co., 12818 Coit Rd., Cleveland 1
Marquette Manufacturing Co., Inc., 307 E. Hennepin, Minneapolis 14
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago 7
Tweco Prod. Co., English at Ida, Wichita 7, Kans.
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Westinghouse Electric and Mfg. Co., East Pittsburgh, Pa.
Wilson Welder & Metals Co., Inc., 60 E. 42nd St., New York City 17

MAGNESIUM—SHEETS, PLATES, BARS, ETC.

American Magnesium Corp., 1706 Gulf Bldg., Pittsburgh
Dow Chemical Company, The, Midland, Mich.

MANIFOLDS, OXYGEN & ACETYLENE

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Bastian-Blessing Co., 4201 Peterson Ave., Chicago 30
Burdett Oxygen Co., 3300 Lakeside Ave., Cleveland 14
Craftsweld Equip. Corp., 2626 Jackson Ave., Long Island City, N. Y.
Eastern Welding Equipment Co., 17 West 60th St., New York City 23
Harris Calorific Co., 5501 Cass Ave., Cleveland 2
Independent Engineering Company, O'Fallon, Ill.
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
Liquid Carbonic Corp., Wall Chemicals Div., 3100 S. Kedzie Ave., Chicago 23
Alexander Milburn Co., 1416 W. Baltimore St., Baltimore 23
Modern Engineering Co., Inc., 3401 Pine Blvd., St. Louis
National Cylinder Gas Co., 205 W. Wacker, Chicago 7
Rail Supply Co., 110 E. 42nd St., New York City 17
Smith Welding Equipment Corp., 2633 Fourth Street, S. E., Minneapolis 14
Universal Power Corp., 4899 Euclid Ave., Cleveland 3
Victor Equipment Co., 844-54 Folsom St., San Francisco 7

METAL-SPRAYING EQUIPMENT

Metallizing Co. of America, Inc., 1330 W. Congress St., Chicago 7
Metallizing Engineering Co., Inc., 38-14 30th St., Long Island City, N. Y.
Alexander Milburn Co., 1416 W. Baltimore St., Baltimore 23

METAL-SPRAYING HOODS

Fibre-Metal Products Co., The, 5th and Tilghman Sts., Chester, Pa.
General Scientific Equip. Co., 1346 W. Somerset St., Philadelphia
Metallizing Co., of America, Inc., 1330 W. Congress St., Chicago 7
Metallizing Engineering Co., Inc., 38-14 30th St., Long Island City, N. Y.
Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh
Sellstrom Mfg. Co., 615 N. Aberdeen St., Chicago 22

NICKEL

International Nickel Co., Inc., 67 Wall St., New York City 5
Steel Sales Corp., 3348 S. Pulaski, Chicago 23

OVENS, ELECTRODE DRYING

Aufhauser Bros. Co., 295 Madison Ave., New York
Moslo Machinery Co., 2443 Prospect Ave., Cleveland 15
Steiner-Ives Co., Newark

OXYGEN, COMPRESSED

Acetylene Gas Company, 3401 Pine Blvd., St. Louis
Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Burdett Oxygen Co., 3300 Lakeside Ave., Cleveland 14
Commercial Gas Corp., 286 Carey Ave., Wilkes-Barre, Pa.
Independent Engineering Company, O'Fallon, Ill.
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
Liquid Carbonic Corp., Wall Chemicals Div., 3100 S. Kedzie Ave., Chicago 23
National Cylinder Gas Co., 205 W. Wacker, Chicago 7

PERSPIRATION RETAINER

American Allsafe Company, Inc., 1245 Niagara St., Buffalo 13, N. Y.
Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh
Standard Safety Equipment Co., 232 W. Ontario St., Chicago 10

PIPE FITTINGS, WELDING

Aluminum Company of America, Gulf Bldg., Pittsburgh
Bonney Forge & Tool Works, Allentown, Pa.
Crane Co., 836 S. Michigan Ave., Chicago 5
Kropp Forge Company, 5301 W. Roosevelt Road, Chicago
Lenape Hydraulic Press & Forging Co., West Chester, Pa.
Midwest Piping & Supply Co., Inc., 1450 South 2nd St., St. Louis 4
Taylor Forge & Pipe Wks., P. O. Box 485 Chicago 90
Tube Turns, 224 E. Broadway, Louisville
Wedge Protectors, Inc., 9522 Richmond Ave., Cleveland

PIPE WELDING CLAMPS

Eastern Welding Equipment Co., 17 W. 60th St., New York City 23
Hercules Electric & Mfg. Co., Inc., 2416 Atlantic Ave., Brooklyn 33
Jewel Mfg. Co., 1841 University Ave., St. Paul 4

PLOW SHARE RECLAIMING UNITS

Wiese Plow Welding Co., 1507 5th Ave., Perry, Ia.

PLUGS & RECEPTACLES

Albert & J. M. Anderson Mfg. Co., 289 A Street, Boston 10
General Electric Co., Schenectady 5, N. Y.
Industrial Products Co., 2802 N. 4th St., Philadelphia 33
Howard B. Jones, 2460 W. George St., Chicago 18
Russell & Stoll Co., 125 Barclay St., New York City 7
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

POLISHER (PORTABLE)

Black & Decker Mfg. Co., The, Towson 4, Md.
Chicago Pneumatic Tool Co., 6 East 44th St., New York City
Cleveland Pneum. Tool Co., 3781 E. 77th St., Cleveland
Independent Pneum. Tool Co., 600 W. Jackson Blvd., Chicago 6
Mall Tool Company, 7740 South Chicago Ave., Chicago 19
NuSteel Co., 1714 S. Ashland Ave., Chicago
Chas. F. Overly Co., 1753 Rosedale Ave., Cleveland 12, O.
Skilsaw, Inc., 4763 Winnemac Ave., Chicago 80
Stanley Elec. Tool Div., 177 Elm St., New Britain, Conn.
Stow Mfg. Co., 443 State St., Binghamton, N. Y.

PORTABLE WELDING SHOPS

Couse Laboratories, 300 Passaic St., Newark
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago 7
Progressive Welder Co., 3050 E. Outer Drive, Detroit 12

POSITIONERS, WELDING

Acme Mfg. Co., 1642 Howard St., Detroit 16
Bentley Welders, Inc., Box 1038, Syracuse 1, N. Y.
Cullen-Friestedt Co., 1309 S. Kilbourn Ave., Chicago 23
Harnischfeger Corp., 4400 W. National Ave., Milwaukee 14
Lyon-Raymond Corp., 299 Madison St., Greene, N. Y.
National Supply Co., Torrance, Calif.
Ransome Machinery Co., Dunellen, N. J.
F. W. Shrader Co., 5788 Washington, Culver City, Calif.
Welding Machines Mfg. Co., 17325 Lamont Ave., Detroit
Whiting Corp., 15699-Q Lathrop Ave., Harvey, Ill.

POTASSIUM SILICATE

E. I. duPont deNemours & Co., Inc., Wilmington 98, Del.
Philadelphia Quartz Company, 120 South Third St., Philadelphia 6

PREHEATING, ANNEALING, STRESS RELIEVING COILS

(See "COILS, PREHEATING, etc.")

PREHEATING TORCHES

Aeroil Burner Co., Inc., Park Ave. & 57th St., West New York, N. J.
Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Dockson Corp., 3839 Wabash Ave., Detroit 8
Harris Calorific Co., 5501 Cass Ave., Cleveland 2
Hauck Mfg. Co., 124 Tenth St., Brooklyn 15, N. Y.
Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago
Insto-Gas Corp., 1900 E. Jefferson Ave., Detroit
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
Liquid Carbonic Corp., Wall Chemicals Div., 3100 S. Kedzie Ave., Chicago 23
Alexander Milburn Co., 1416 W. Baltimore St., Baltimore 23
Smith Welding Equipment Corp., 2633 Fourth Street, S. E., Minneapolis 14
Torit Mfg. Co., 270 Walnut St., St. Paul 2
Victor Equipment Co., 844-54 Folsom St., San Francisco 7

PROJECTION WELDERS

Acme Elec. Welder Co., 2618 Fruitland Rd., Los Angeles
Acro Welder Mfg. Co., Inc., 1825 W. St. Paul Ave., Milwaukee 3
Agnew Electric Company, Milford, Mich.
American Elec. Fusion Corp., 2600 Diversey Ave., Chicago 47
Dyer Welder & Engineering Co., 7 East 19th Street, Kansas City 8, Mo.
Eisler Engr. Co., 749 S. 13th St., Newark 3
Expert Welding Machine Co., 17144 Mt. Elliott St., Detroit
Federal Mach. & Welder Co., 212 Dana St., Warren, Ohio
Larkin Lectro Products Co., 220 Taaffe Place, Brooklyn 5
National Elec. Welding Mach. Co., 1846 N. Trumbull St., Bay City, Mich.
Progressive Welder Co., 3050 Outer Drive, Detroit 12
Sciaky Bros., 4915 W. 67th St., Chicago 38
Taylor-Winfield Corp., Warren, O.
Thomson-Gibb Electric Welding Co., 161 Pleasant St., Lynn, Mass.
Unique Mfg. Co., 233 W. Walton, Chicago
Universal Power Corp., 4899 Euclid Ave., Cleveland 3
Welding Machines Mfg. Co., 17325 Lamont Ave., Detroit 12

RADIUM, INSPECTION

Canadian Radium & Uranium Corp., 630 Fifth Ave., New York City 20
Radium Chemical Co., Inc., 570 Lexington Ave., New York City 22

RAIL WELDER, FLASH BUTT

Federal Mach. & Welder Co., 212 Dana St., Warren, Ohio
Sciaky Bros., 4915 W. 67th St., Chicago 38
Sperry Products, Inc., Hoboken, N. J.

REFRIGERATION UNITS (RESISTANCE WELDER)

Acro Welder Mfg. Co., Inc., 1825 W. St. Paul Ave., Milwaukee 3
Fairbanks-Morse & Co., 600 So. Michigan Ave., Chicago 5
Frostrode Products, 19003 John R St., Detroit 3
Temprite Products Corp., 47 Piquette Ave., Detroit
Weltronic Corp., 3080 S. Outer Dr., Detroit

REGALVANIZING COATINGS

Aget-Detroit Co., 602 First National Bank Bldg., Ann Arbor, Mich.
American Solder & Flux Co., 2152 E. Norris St., Philadelphia
Eutectic Welding Alloys Co., 40 Worth St., New York City 13
Galv-Weld, Inc., 314 W. First St., Dayton 2

REGULATORS, OXYGEN & ACETYLENE

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Bastian-Blessing Co., 4201 Peterson Ave., Chicago 30
Burdett Oxygen Co., 3300 Lakeside Ave., Cleveland 14
Craftsweld Equipment Corp., 2626 Jackson Ave., Long Island City 1, N. Y.
Dockson Corp., 3839 Wabash Ave., Detroit 8
General Welding & Equip. Co., 268 Northampton St., Boston 18
Harris Calorific Co., 5501 Cass Ave., Cleveland 2
Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago
K-G Welding & Cutting Co., 515 W. 29th St., New York City
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
Liquid Carbonic Corp., Wall Chemicals Div., 3100 S. Kedzie Ave., Chicago 23
Metallizing Co., of America, Inc., 1330 W. Congress St., Chicago 7
Metro Mfg. Co., 93-04 150th St., Jamaica 2, N. Y.
Alexander Milburn Co., 1416 W. Baltimore St., Baltimore 23
Modern Engineering Co., 3401 Pine Blvd., St. Louis
J. Nageldinger & Son, Inc., 409 East 91st St., New York City 28
National Cylinder Gas Co., 205 W. Wacker, Chicago 7
Rail Supply Co., 110 E. 42nd St., New York City 17
Safety Shock Mfg. Co., Fowler, Calif.
Smith Welding Equipment Corp., 2633 Fourth Street, S. E., Minneapolis 14
Superior Oxy-Acetylene Mach. Co., 1102 High St., Hamilton, O.
Victor Equipment Co., 844-54 Folsom St., San Francisco
Welders Supply & Mfg. Co., 108 W. Central Parkway, Cincinnati
Weldit Acetylene Co., 636 Bagley, Detroit 26

RESISTANCE WELDERS

Acme Elec. Welder Co., 2618 Fruitland Rd., Los Angeles
Acro Welder Mfg. Co, Inc., 1825 W. St. Paul Ave., Milwaukee 3
Agnew Electric Co., Milford, Mich.
American Elec. Fusion Corp., 2600 Diversey Ave., Chicago 47
Armglo Co., 3530 Pierce St., Milwaukee
Dyer Welder & Engineering Co., 7 East 19th St., Kansas City 8, Mo.
Expert Welding Machine Co., 17144 Mt. Elliott St., Detroit
Federal Mach. & Welder Co., 212 Dana St., Warren, Ohio
Hercules Elec. & Mfg. Co., Inc., 2416 Atlantic Ave., Brooklyn 33
Larkin Lectro Products Co., 220 Taaffe Pl., Brooklyn 5
Micro Products Co., 20 N. Wacker Drive, Chicago
Multi-Hydromatic Welding & Mfg. Co., 9640 Grinnell, Detroit
National Elec. Welding Mach. Co., 1846 N. Trumbull St., Bay City, Mich.
Pier Equip. Mfg. Co., 502 Cross, Benton Harbor, Mich.
Progressive Welder Co., 3050 E. Outer Dr., Detroit 12
Sciaky Bros., 4915 W. 67th St., Chicago 38
Swift Electric Welder Co., 6560 Epworth Bldg., Detroit
Taylor-Hall Welding Corp., 100 Hope Ave., Worcester, Mass.

RESISTANCE WELDERS (Cont.)

Taylor-Winfield Corp., Warren, O.
Thomson-Gibb Electric Welding Co., 161 Pleasant St., Lynn, Mass.
Universal Power Corp., 4899 Euclid Ave., Cleveland 3
Victor Equipment Co., 844-54 Folsom St., San Francisco
Weldex, Inc., 7326 McDonald St., Detroit
Welding Machines Mfg. Co., 17325 Lamont Ave., Detroit 12

RESPIRATORS

American Optical Co., 16 Mechanic St., Southbridge, Mass.
Boyer-Campbell Co., 6540 Antoine St., Detroit
Chicago Eye Shield Co., 2300 Warren Blvd., Chicago 12
Davis Emergency Equip. Co., Inc., 45 Halleck St., Newark 4
Eastern Safety Clothing Co., 23 W. 60th St., New York City 23
General Scientific Equip. Co., 1346 W. Somerset St., Philadelphia 32
Industrial Prod. Co., 2820 N. 4th St., Philadelphia 33
Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh
Parker Safety Equipment Co., 785 Lyons St., Irvington, N. J.
Pulmosan Safety Equipment Corp., 176 Johnson St., Brooklyn 1
Sellstrom Mfg. Co., 615 N. Aberdeen St., Chicago 22
Superior Oxy-Acetylene Mach. Co., 1102 High St., Hamilton, O.
Willson Products, Inc., 2nd and Washington Sts., Reading, Pa.

RHEOSTATS

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Cutler-Hammer, Inc., 315 N. 12th St., Milwaukee 1
General Electric Co., Schenectady 5, N. Y.
Ohmite Mfg. Co., 4835 W. Flournoy, Chicago
Lincoln Electric Co., 12818 Coit Rd., Cleveland 1
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Westinghouse Electric and Mfg. Co., East Pittsburgh
Wilson Welder & Metals Inc., 60 E. 42nd St., New York City 17

RODS, BARE

(See "WELDING RODS")

ROTARY FILES

Carbur, Inc., Lincoln Park 25, Mich.
Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chicago 6
Special Welding Alloy Co., Inc., 27-33 Jackson, Long Island City, N. Y.
Stow Mfg. Co., 443 State St., Binghamton, N. Y.

SALT TABLETS & DISPENSERS

Boyer-Campbell Co., 6540 Antoine St., Detroit
Davis Emergency Equip. Co., Inc., 45 Halleck St., Newark 4
Dockson Corp., 3839 Wabash Ave., Detroit 8
General Scientific Equip. Co., 1346 W. Somerset St., Philadelphia 32
Industrial Prod. Co., 2820 N. 4th St., Philadelphia 33
International Salt Co., Inc., Spruce and Adams, Scranton 2, Pa.
Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh
Morton Salt Co., 310 S. Michigan Ave., Chicago
Pulmosan Safety Equipment Corp., 176 Johnson St., Brooklyn 1
Standard Safety Equip. Co., 232 W. Ontario St., Chicago 10

SANDBLAST EQUIPMENT

Chicago Eye Shield Company, 2300 Warren Blvd., Chicago 12
Industrial Prod. Co., 2820 N. 4th St., Philadelphia
Metallizing Co. of America, Inc., 1330 W. Congress St., Chicago 7
Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh
Ruemelin Mfg. Co., 3880 N. Palmer St., Milwaukee 1
Steody Co., 1135 W. Slauson Ave., Whittier, Calif.
Willson Products, Inc., 2nd and Washington Sts., Reading, Pa.

SANDBLAST ABRASIVES

Carborundum Co., The, Niagara Falls, N. Y.
Metallizing Co. of America, Inc., 1330 W. Congress, Chicago 7

SANDERS (PORTABLE)

Black & Decker Mfg. Co., The, Towson 4, Md.
Chicago Pneumatic Tool Co., 6 East 44th St., New York City
Independent Pneum. Tool Co., 600 W. Jackson Blvd., Chicago 6
Porter-Cable Machine Co., 1714 N. Salina St., Syracuse 8
Rotor Tool Co., 17325 Euclid Ave., Cleveland
Skilsaw, Inc., 4763 Winnemac Ave., Chicago 30
Stanley Elec. Tool Div., 177 Elm St., New Britain, Conn.
Stow Mfg. Co., 443 State St., Binghamton, N. Y.

SCALING HAMMERS

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Atlas Welding Accessories Co., 14824 Wyoming Ave., Detroit 21
Black & Decker Mfg. Co., The, Towson 4, Md.
Carter-Lockard Co., 225 W. 11th St., Los Angeles 15
Chicago Pneumatic Tool Co., 6 East 44th St., New York City
Dallett Co., The, Mascher at Lippincott St., Philadelphia 33
Independent Pneu. Tool Co., 600 W. Jackson Blvd., Chicago 6
Chas. F. Overly Co., 1753 Rosedale Ave., Cleveland 12, O.
St. Pierre Chain Corp., Frank St., Worcester, Mass.
Stanley Electric Tool Division, New Britain, Conn.
Trindl Products Ltd., 17 E. 23rd St., Chicago 16
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Wilson Welder & Metals Co., Inc., 60 E. 42nd St., New York City 17

SCALING HAMMERS, PNEUMATIC

Chicago Pneumatic Tool Co., 6 East 44th St., New York City
Dallett Co., The, Mascher at Lippincott St., Philadelphia 33
Independent Pneum. Tool Co., 600 W. Jackson Blvd., Chicago 6

SEAM WELDERS, RESISTANCE

Acro Welder Mfg. Co., Inc., 1825 W. St. Paul Ave., Milwaukee 3
Agnew Electric Co., Milford, Mich.
American Electric Fusion Corp., 2600 Diversey Ave., Chicago 47
Eisler Engr. Co., 749 S. 13th St., Newark 3
Electric Arc, Inc., 152 Jelliff Ave., Newark
Expert Welding Machine Co., 17144 Mt. Elliott St., Detroit
Federal Mach. & Welder Co., 212 Dana St., Warren, Ohio
Larkin Lectro Products Co., 220 Taaffe Place, Brooklyn 5
National Elec. Welding Mach. Co., 1846 N. Trumbull St., Bay City, Mich.
Progressive Welder Co., 3050 Outer Drive, Detroit 12
Sciaky Bros, 4915 W. 67th St., Chicago 38
Taylor-Winfield Corp., Warren, O.
Thomson-Gibb Electric Welding Co., 161 Pleasant St., Lynn, Mass.
Universal Power Corp., 4899 Euclid, Cleveland 3
Welding Machines Mfg. Co., 17325 Lamont Ave., Detroit 12

SHOES, SAFETY

International Shoe Co., 1509 Washington St., St. Louis
Lehigh Safety Shoe Co., Inc., Allentown, Pa.
Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh
Pulmosan Safety Equipment Corp., 176 Johnson St., Brooklyn 1

SLEEVES, PROTECTIVE

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
American Allsafe Company, Inc., 1245 Niagara St., Buffalo 13, N. Y.
American Optical Co., 16 Mechanic St., Southbridge, Mass.
B. & H. Welder's Supplies, 403 Fourth Street, Portsmouth, Va.
Boyer-Campbell Co., 6540 Antoine St., Detroit
Davis Emergency Equip. Co., Inc., 45 Halleck St., Newark 4
Eastern Equipment Co., Inc., Willow Grove, Pa.
Eastern Safety Clothing Co., 23 W. 60th Street, New York City 23
Ergolyte Mfg. Co., 3627 N. Lawrence St., Philadelphia 40
Fibre-Metal Prod. Co., The, 5th and Tilghman St., Chester, Pa.
General Electric Co., Schenectady 5, N. Y.
General Scientific Equip. Co., 1346 W. Somerset St., Philadelphia
Industrial Gloves Co., Danville, Ill.
Industrial Prod. Co., 2820 N. 4th St., Philadelphia 33
Fred Jessar, 404 Denckla Bldg., Philadelphia 7
Kimball Safety Prod. Co., 7314 Wade Park Ave., Cleveland
Lincoln Electric Co., 12818 Coit Rd., Cleveland 1
Liquid Carbonic Corp., Wall Chemicals Div., 3100 S. Kedzie Ave., Chicago 23
Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago 7
Pulmosan Safety Equipment Corp., 176 Johnson St., Brooklyn 1
Rail Supply Co., 110 E. 42nd St., New York City 17
S. C. Leather Co., 819 Fifth Ave., Pittsburgh 19
Safety Clothing & Equip. Co., 7016 Euclid Ave., Cleveland
Sellstrom Mfg. Co., 615 N. Aberdeen St., Chicago 22
Singer Leather Clothing Co., 129 No. 12th St., Philadelphia
Standard Safety Equipment Co., 232 W. Ontario, Chicago 10
Steel Sales Corp., 3348 S. Pulaski, Chicago 23
Superior Oxy-Acetylene Mach. Co., 1102 High St., Hamilton, O.
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Westinghouse Electric and Mfg. Co., East Pittsburgh, Pennsylvania

SODIUM SILICATE

American Chemical & Flux Co., 520 W. 48th St., New York City
Diamond Alkali Company, 2407 Oliver Bldg., Pittsburgh
E. I. duPont deNemours & Co., Inc., Wilmington 98, Del.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia 7
Philadelphia Quartz Co., 125 S. 3rd, Philadelphia 6

SOLDER

Central Steel & Wire Co., 3000 W. 51st St., Chicago 80
Eastern Welding Equipment Co., 17 W. 60th St., New York City 23
Galv-Weld, Inc., 314 W. First St., Dayton, O.
Metal Bond Mfg. Co., 3201 Kossuth Ave., St. Louis 7
Joseph T. Ryerson & Son, Inc., 2558 W. 16th St., Chicago

SOLDER, ALUMINUM

Aladdin Rod & Flux Mfg. Co., Grand Rapids 7, Mich.
Aluminum Company of America, Gulf Bldg., Pittsburgh
American Solder & Flux Co., 2152 E. Norris St., Philadelphia
Childs Aluminum Solder Company, 4020 Tenth Ave., New York City 34
Eastern Welding Equipment Co., 17 W. 60th St., New York City 23
Eutectic Welding Alloys Co., 40 Worth St., New York City 13
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
Metal Bond Mfg. Co., 3201 Kossuth Ave., St. Louis 7
Modern Engineering Co., Inc., 3401 Pine Blvd., St. Louis
Smith Welding Equipment Corp., 2633 Fourth Street, S. E., Minneapolis
Special Welding Alloy Co., Inc., 27-33 Jackson, Long Island City, N. Y.
Steel Sales Corp., 3348 S. Pulaski, Chicago 23
Victor Equipment Co., 844-54 Folsom St., San Francisco 7

SOLDER, HARD

Childs Aluminum Solder Company, 4020 Tenth Ave., New York City 34
Eutectic Welding Alloys Co., 40 Worth St., New York City 13
Handy & Harman, 82 Fulton St., New York City 7
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
Metal Bond Mfg. Co., 3201 Kossuth Ave., St. Louis 7
Special Welding Alloy Co., Inc., 27-33 Jackson, Long Island City, N. Y.
Victor Equipment Co., 844-54 Folsom St., San Francisco 7

SOLDER, SILVER

Central Steel & Wire Co., 3000 W. 51st St., Chicago 80
Chase Brass & Copper Co., Inc., 238 Grand St., Waterbury, Conn.
Eastern Welding Equipment Co., 17 W. 60th St., New York City 23
Eutectic Welding Alloys Co., 40 Worth St., New York City 13
Goldsmith Bros. Smelting & Ref. Co., 58 E. Washington St., Chicago 2
Handy & Harman, 82 Fulton St., New York City 7
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
P. R. Mallory & Co., Inc., 3029 E. Washington, Indianapolis 6
Modern Engineering Co., Inc., 3401 Pine Blvd., St. Louis
Sherman & Co., 193 Canal St., New York City 13
Steel Sales Corp., 3348 S. Pulaski, Chicago 23
Superior Oxy-Acetylene Mach. Co., 1102 High St., Hamilton, O.
Victor Equipment Co., 844-54 Folsom St., San Francisco 7

SOLDERING OUTFITS

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Ajax Electrothermic Corp., Ajax Park, Trenton 5
Eastern Welding Equipment Co., 17 W. 60th St., New York City 23
Eisler Engineering Co., Inc., 749 S. 13th St., Newark 3
Ergolyte Mfg. Co., 3627 N. Lawrence St., Philadelphia 40
General Welding & Equip. Co., 268 Northampton St., Boston 18
Ideal Commutator Dresser Co., 1935 Park Ave., Sycamore, Ill.
Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
Liquid Carbonic Corp., Wall Chemicals Div., 3100 S. Kedzie Ave., Chicago 23
Metal Bond Mfg. Co., 3201 Kossuth Ave., St. Louis 7
Modern Engineering Co., Inc., 3401 Pine Blvd., St. Louis
Sight Feed Generator Co., 14 N. 10th St., Richmond, Ind.

SOLDERING OUTFITS (Cont.)

Smith Welding Equipment Corp., 2633 Fourth Street, S.E., Minneapolis 14
Superior Oxy-Acetylene Mach. Co., 1102 High St., Hamilton, O.
Torit Mfg. Co., 270 Walnut St., St. Paul 2
Victor Equipment Co., 844-54 Folsom St., San Francisco 7

SPATTER PREVENTIVES

Acme Paint Co., 8250 St. Aubin Ave., Detroit 11
John C. Dolph Co., 170A Emmett St., Newark
General Electric Co., Schenectady 5, N. Y.
Marquette Mfg. Co., Inc., 307 E. Hennepin St., Minneapolis 14
Midland Paint & Varnish Co., 9115 Reno St., Cleveland
George R. Mowatt Co., 24 West 40th St., New York City 18
Oakite Products Inc., 23 Thames St., New York City 6
G. W. Smith & Sons, Dayton, O.
Steel Sales Corp., 3348 S. Pulaski, Chicago 23
U. S. Steel Supply Co., 1319 Wabansia Ave., Chicago 90
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Wayne Chemical Prod. Co., 9800 Copeland St., Detroit

SPOT WELDERS

Acme Elec. Welder Co., 2618 Fruitland Rd., Los Angeles 11
Acro Welder Mfg. Co., Inc., 1825 W. St. Paul Ave., Milwaukee 3
Agnew Electric Co., Milford, Mich.
American Elec. Fusion Corp., 2600 Diversey Ave., Chicago 47
E. D. Caddington Mfg. Co., 5024 N. 37th St., Milwaukee 9
Dyer Welder & Engineering Co., 7 East 19th Street, Kansas City 8, Mo.
Eisler Engineering Co., Inc., 749 S. 13th St., Newark 3
Expert Welding Machine Co., 17144 Mt. Elliott, Detroit
Federal Mach. & Welder Co., 212 Dana St., Warren, O.
Hercules Electric & Mfg Co., Inc., 2416 Atlantic Ave., Brooklyn 33
Larkin Lectro Products Co., 220 Taaffe Pl., Brooklyn 5
Micro Products Co., 20 North Wacker Drive, Chicago 6
National Elec. Welding Mach. Co., 1846 N. Trumbull St., Bay City, Mich.
Pier Equip. Mfg. Co., 502 Cross, Benton Harbor, Mich.
Progressive Welder Co., 3050 E. Outer Dr., Detroit 12
Sciaky Bros., 4915 W. 67th St., Chicago 38
Taylor-Hall Welding Corp., 100 Hope Ave., Worcester, Mass.
Taylor-Winfield Corp., Warren, O.
Thomson-Gibb Elec. Weld. Co., 161 Pleasant St., Lynn, Mass.
Universal Power Corp., 4899 Euclid Ave., Cleveland 3
Welding Machines Mfg. Co., 17325 Lamont Ave., Detroit 12

SPOT-WELDING GUNS

(See "GUNS, SPOT-WELDING")

STEEL (SHEETS, PLATES, BARS, STRUCTURAL SHAPES, ETC.)

American Rolling Mill Co., Curtis St., Middletown, O.
Bethlehem Steel Co., 701 E. Third St., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., 434 5th Ave., Pittsburgh 30
Crucible Steel Co. of America, New York City
Great Lakes Steel Corp., Ecorse, Detroit 18
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 S. Dearborn St., Chicago
Jones & Laughlin Steel Corp., Pittsburgh
Lukens Steel Co., So. 1st Ave., Coatesville, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 4
Joseph T. Ryerson & Son, Inc., 2558 W. 16th St., Chicago
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.
U. S. Steel Supply Co., 1319 Wabansia, Chicago 90
Youngstown Sheet & Steel Co., Youngstown, O.

STEEL, MONEL CLAD

International Nickel Co. Inc., 67 Wall St., New York City 5
Lukens Steel Co., So. 1st Ave., Coatesville, Pa.
Steel Sales Corp., 3348 S. Pulaski, Chicago 23

STEEL, NICKEL CLAD

International Nickel Co., Inc., 67 Wall St., New York City 5
Lukens Steel Co., So. 1st Ave., Coatesville, Pa.
Steel Sales Corp., 3348 S. Pulaski, Chicago 23

STEEL, STAINLESS

Allegheny Ludlum Steel Corp., Brackenridge 2, Pa.
American Rolling Mill Co., Curtis St., Middletown, O.
American Steel & Wire Co., 614 Superior Ave., N.W., Cleveland 13, O.
Carnegie-Illinois Steel Corp., 434 5th Ave., Pittsburgh 30
Central Steel & Wire Co., 3000 W. 51st St., Chicago 80
Crucible Steel Co. of America, New York City
Ingersoll Steel & Disc. Div., Borg-Warner Corp., 310 S. Michigan Ave., Chicago
Lukens Steel Company, So. 1st Ave., Coatesville, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 4
Ryerson, Joseph T. & Son, Inc., 2558 W. 16th St., Chicago
U. S. Steel Supply Co., 1319 Wabansia Ave., Chicago 90

STEEL, STAINLESS CLAD

Allegheny Ludlum Steel Corp., Brackenridge 2, Pa.
Crucible Steel Co. of America, New York City
Ingersoll Steel & Disc. Div., Borg-Warner Corp., 310 S. Michigan Ave., Chicago
Jessop Steel Co., Washington, Pa.
Lukens Steel Co., So. 1st Ave., Coatesville, Pa.
Ryerson, Joseph T. & Son, Inc., 2558 W. 16th St., Chicago

STRAIGHTENERS, WIRE

Aufhauser Bros. Co., 295 Madison Ave., New York City
Electric Arc, Inc., 152 Jelliff Ave., Newark
Lewis Machine Co., 3441 E. 76th St., Cleveland
Moslo Machinery Co., 2443 Prospect Ave., Cleveland 15

STRIPPERS, ELECTRODE

Aufhauser Bros. Co., 295 Madison Ave., New York City
Electric Arc, Inc., 152 Jelliff Ave., Newark
Moslo Machinery Co., 2443 Prospect Ave., Cleveland 15

STUD WELDERS

Acro Welder Mfg. Co., Inc., 1825 W. St. Paul Ave., Milwaukee
Agnew Electric Co., Milford, Mich.
Chicago Tool and Engineering Co., 8383 So. Chicago Ave., Chicago 17
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago 7
Nelson Specialty Welding Equipment Co., 440 Peralta St., San Leandro, Calif.

SURFACE-HARDENING POWDER

Anti-Borax Compound Co., Inc., 1506 Wall St., Fort Wayne 6, Ind.
Lincoln Electric Co., 12818 Coit Rd., Cleveland 1
Wall-Colmonoy Corp., 720 Fisher Bldg., Detroit 2

TABLES, WELDING

Bentley Weldery, Inc., Box 1038, Syracuse 1, N. Y.
Chicago Hardware Foundry Co., North Chicago, Ill.
Cullen-Friestedt Co., 1309 S. Kilbourn Ave., Chicago 23
Hamilton Tool Co., 9th & Hanover Sts., Hamilton, O.
Hobart Bros. Co., Troy 1, O.
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
Lyon-Raymond Corp., 299 Madison St., Greene, N. Y.
Ransome Machinery Co., Dunellen, N. J.
Victor Equipment Co., 844-54 Folsom St., San Francisco 7

TEMPERATURE RECORDING PELLETS

Electric Arc, Inc., 152 Jelliff Ave., Newark
Tempil Corp., 132 W. 22nd St., New York City 11

TESTING EQUIPMENT, TENSILE

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Baldwin-Southwark Div., The Baldwin Locomotive Works, Philadelphia 42
Electric Arc, Inc., 152 Jelliff Ave., Newark
Riehle Testing Machine Div., American Machine and Metals, Inc., East Moline, Ill.

TESTING EQUIPMENT, WELD

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Baldwin Southwark Div., The Baldwin Locomotive Works, Philadelphia 42
Detroit Testing Machine Co., 9390 Grinnell St., Detroit
Fibre-Metal Prod. Co., The, 5th and Tilghman St., Chester, Pa.
Claud S. Gordon Co., 3000 So. Wallace St., Chicago 16
Linde Air Products Co., 30 E. 42nd St., New York City 17
Riehle Testing Machine Div., American Machine and Metals, Inc., East Moline, Ill.
Streeter-Amet Co., 4140 N. Ravenswood Ave., Chicago 13

THERMIT, EQUIPMENT & SUPPLIES

Metal & Thermit Corp., 120 Broadway, New York City 5

TIMERS, RESISTANCE WELDING

American Electric Fusion Corp., 2600 Diversey Ave., Chicago 47
R. W. Cramer Co., Inc., Centerbrook, Conn.
Cutler-Hammer, Inc., 315 N. 12th St., Milwaukee 1
Dyer Welder & Engineering Company, 7 East 19th Street, Kansas City 8, Mo.
Eisler Engineering Co., The, 749 S. 13th St., Newark 3
Electric Controller & Mfg. Co., 2700 E. 79th St., Cleveland 4
Federal Mach. & Welder Co., 212 Dana St., Warren, O.
General Electric Co., Schenectady 5, N. Y.
Hercules Elec. & Mfg. Co., Inc., 2416 Atlantic Ave., Brooklyn 33
Industrial Timer Corp., 117 Edison Place, Newark
Larkin Lectro Products Co., 220 Taaffe Pl., Brooklyn 5
National Time & Signal Corp., 603 E. Milwaukee, Detroit
Photovolt Corp., 95 Madison Ave., New York City
Pier Equip. Mfg. Co., 502 Cross, Benton Harbor, Mich.
Sciaky Bros., 4915 W. 67th St., Chicago 38
Square D Co., 4041 N. Richards, Milwaukee 12
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Weltronic Co., 3080 E. Outer Drive, Detroit, Mich.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh

TINNING COMPOUNDS

Aladdin Rod & Flux Mfg. Co., Grand Rapids 7, Mich.
American Solder & Flux Co., 2152 E. Norris St., Philadelphia 25
Anti-Borax Compound Co., Inc., 1506 Wall St., Fort Wayne 6, Ind.
Eutectic Welding Alloys Co., 40 Worth St., New York City
Lloyd S. Johnson Co., 2241 Indiana Ave., Chicago
Metal Bond Mfg. Co., 3201 Kossuth Ave., St. Louis 7
Wayne Chemical Products Co., Copeland & M.C.R.R. Detroit 17, Mich.
York Engineering Co., 3349 Ogden, Chicago 23

TOOLS, WELDORS'

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Atlas Welding Accessories Co., 14824 Wyoming Ave., Detroit 21
Carter Lockard Co., 225 W. 11th St., Los Angeles
Chicago Mfg. & Distributing Co., 1928 West 46th St., Chicago 9
Cincinnati Tool Co., 1951 Waverly Ave., Norwood 12
Dallett Co., The, Mascher at Lippincott St., Philadelphia, 33
Eisler Engineering Co., Inc., 749 S. 13th St., Newark 3
Ergolyte Mfg. Co., 3627 N. Lawrence St., Philadelphia 40
General Electric Co., Schenectady 5, N. Y.
Independent Pneumatic Tool Co., 600 W Jackson Blvd., Chicago 6
Jewel Manufacturing Co., 1841 University Ave., St. Paul 4
Lincoln Electric Co., 12818 Coit Rd., Cleveland 1
Liquid Carbonic Corp., Wall Chemicals Div., 3100 S. Kedzie Ave., Chicago 23
Modern Engineering Co., Inc., 3401 Pine Blvd., St. Louis
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago 7
Osborn Mfg. Co., Cleveland
St. Pierre Chain Corp., Frank St., Worcester, Mass.
Stanley Elec., Tool Div., 177 Elm St., New Britain, Conn.
Templeton, Kenly & Co., 1020 S. Central Ave., Chicago
Welding Engineering Co., 264 E. Ogden, Milwaukee 2
Wyzenbeek and Staff, Inc., 838 W. Hubbard St., Chicago

TORCHES, ARC

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Albert & J. M. Anderson Mfg. Co., 289 A Street, Boston 10
Chicago Tool & Engineering Co., 8383 South Chicago Ave., Chicago 17
Hammett Elec. Mfg. Co., 2858 McGee St., Kansas City, Mo.
Larkin Lectro Products, 220 Taaffe Place, Brooklyn 5
Marquette Mfg. Co., Inc., 307 E. Hennepin St., Minneapolis 14
Mid-States Equip. Co., 2137 S. Wabash Ave., Chicago
Trindl Products, Ltd., 17 E. 23rd St., Chicago 16

TORCH LIGHTERS

(See "LIGHTERS, TORCH")

TORCHES, GAS

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Albert & J. M. Anderson Mfg. Co., 289 A St., Boston 10
Bastian-Blessing Co., 4201 Peterson Ave., Chicago 30
Burdett Oxygen Co., 3300 Lakeside Ave., Cleveland 14
Chicago Tool and Engineering Co., 8383 South Chicago Ave., Chicago 17
Clayton & Lambert Mfg. Co., 11111 French Road, Detroit
Craftsweld Equip. Corp., 2626 Jackson Ave., Long Island City, N. Y.
Dill Mfg. Co., 700 E. 82nd St., Cleveland
Dockson Corp., 3839 Wabash, Detroit 8
Eastern Welding Equipment Co., 17 West 60th St., New York City 23
Eisler Engr. Co., Inc., 740 S. 13th St., Newark 3
General Welding & Equipment Co., 268 Northampton St., Boston 18
Harris Calorific Co., 5501 Cass Ave., Cleveland 2
Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago
Insto-Gas Corp., 1900 E. Jefferson Ave., Detroit
K-G Welding & Cutting Co., 515 W. 29th St., New York City
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
Liquid Carbonic Corp., Wall Chemicals Div., 3100 S. Kedzie Ave., Chicago 23
Metro Mfg. Co., 93-04 150th St., Jamaica 2, N. Y.
Alexander Milburn Co., 1416 W. Baltimore St., Baltimore 23

TORCHES, GAS (Cont.)

Modern Engineering Co., 3401 Pine Blvd., St. Louis
National Cylinder Gas Co., 205 W. Wacker, Chicago 7
Rail Supply Co., 110 E. 42nd St., New York City 17
Smith Welding Equipment Corp., 2633 Fourth Street, S. E., Minneapolis 14
Superior Oxy-Acetylene Mach. Co., 1102 High St., Hamilton, O.
Torit Mfg. Co., 270 Walnut St., St. Paul
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Welders Supply & Mfg. Co., 108 W. Central Parkway, Cincinnati
Welding Engineering Co., 264 E. Ogden, Milwaukee 2
Weldit Acetylene Co., 636 Bagley, Detroit 26
Wilson Welder & Metals Co. Inc., 60 E. 42nd St., New York City 17

TRAILERS, WELDER

Electric Arc, Inc., 152 Jelliff Ave., Newark
General Electric Co., Schenectady 5, N. Y.
Harnischfeger Corp., 4400 W. National Ave., Milwaukee
Hobart Bros. Co., Troy 1, O.
Sciaky Bros., 4915 W. 67th St., Chicago
F. W. Shrader Co., 5788 Washington, Culver City, Calif.
Universal Power Corp., 4299 Euclid, Cleveland 3

TRANSFORMERS, RESISTANCE WELDING

Eisler Engineering Co., Inc., 749 S. 13th St., Newark 3
General Electric Co., Schenectady 5, N. Y.
Westinghouse Electric and Mfg. Co., East Pittsburgh, Pa.

TRUCKS, CYLINDER

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Burdett Oxygen Co., 3300 Lakeside Ave., Cleveland 14
Garlinghouse Brothers, 2416 E. 16th St., Los Angeles
Lewis-Shepard Sales Corp., 117 Walnut St., Watertown Station, Boston
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
Modern Engineering Co., 3401 Pine Blvd., St. Louis
National Cylinder Gas Co., 205 W. Wacker, Chicago 7
Gordon Smith Co., Bowling Green, Ky.
Victor Equipment Co., 844-54 Folsom St., San Francisco 7

TUNGSTEN ELECTRODES

(See "ELECTRODES, TUNGSTEN")

VALVES, CYLINDER

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Bastian-Blessing Co., 4239 Peterson Ave., Chicago 30
Independent Engineering Co., 101 West Second St., O'Fallon, Ill.
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago 7
Safety Shock Mfg. Co., Fowler, Calif.

VENTILATING APPARATUS

Aget-Detroit Mfg. Co., 602 First National Bank Bldg., Ann Arbor, Mich.
Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Chelsea Fan and Blower Co., 1206 Grove St., Irvington, N. J.
General Blower Co., 403 N. Peoria St., Chicago 22
Ilg Elec. Ventilating Co., 2850 N. Crawford Ave., Chicago
Metal Bond Mfg. Co., 3201 Kossuth Ave., St. Louis 7
Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh
Ruemelin Mfg. Co., 3880 N. Palmer St., Milwaukee 1
Claude B. Schneible Company, 3951 Lawrence Ave., Chicago
A. O. Smith Corp., 27th & Hopkins, Milwaukee
Standard Safety Equipment Co., 232 W. Ontario St., Chicago 10
Torit Mfg. Co., 270 Walnut St., St. Paul
United Blower Co., 193 W. Centre St., New York City
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Whiting Corp., Harvey, Ill.
Wilson Welder & Metals, Inc., 60 E. 42nd St., New York City 17

WEDGE BARS

American Manganese Steel Div., 389 E. 14th St., Chicago Heights, Ill.
Manganese Steel Forge Co., Richmond St. & Castor Ave., Philadelphia
Marquette Mfg. Co., Inc., 307 E. Hennepin, Minneapolis 14
Standard Steel & Wire Co., Bolivar, Pa.
Stulz-Sickles Co., 134-142 Lafayette St., Newark 5

WELDING COMPOUNDS

American Solder & Flux Co., 2152 E. Norris St., Philadelphia
Anti-Borax Compound Co., 1506 Wall St., Ft. Wayne 6, Ind.
Central Steel & Wire Co., 3000 W. 51st St., Chicago 80
Cortland Welding Compound Co., 12-16 Crawford St., Cortland, N. Y.
Dockson Corporation, 3839 Wabash, Detroit 8
Eutectic Welding Alloys Co., 40 Worth St., New York City 13
Krembs & Co., 669 W. Ohio St., Chicago 10
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
Marquette Mfg. Co., Inc., 307 E. Hennepin St., Minneapolis 14
Metal Bond Mfg. Co., 3201 Kossuth Ave., St. Louis 7
Superior Oxy-Acetylene Mach. Co., 1102 High St., Hamilton, O.
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
York Engrg., 3349 Ogden, Chicago 23

WELDING MACHINES, GAS

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
Marquette Mfg. Co., Inc., 307 E. Hennepin St., Minneapolis 14
Modern Engrg. Co., Inc., 3401 Pine Blvd., St. Louis
National Cylinder Gas Co., 205 W. Wacker, Chicago 7
Rail Supply Co., 110 E. 42nd St., New York City 17
Superior Oxy-Acetylene Mach. Co., 1102 High St., Hamilton, O.
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Weldit Acetylene Co., 636 Bagley, Detroit 26

WELDING ROD, ALUMINUM

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Aluminum Company of America, Gulf Bldg., Pittsburgh
Atlas Foundry Co., 517 Lyons Ave., Irvington 11, N. J.
Central Steel & Wire Co., 3000 W. 51st St., Chicago 80
Chicago Hardware Foundry Co., North Chicago, Ill.
Eastern Welding Equipment Company, 17 West 60th St., New York City 23
Eutectic Welding Alloys Co., 40 Worth St., New York City 13
Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
Marquette Mfg. Co. Inc., 307 E. Hennepin St., Minneapolis 14
Modern Engineering Co., Inc., 3401 Pine Blvd., St. Louis
National Cylinder Gas Co., 205 W. Wacker, Chicago 7
Special Welding Alloy Co., Inc., 27-33 Jackson, Long Island City, N. Y.
Standard Electrode & Mfg. Corp., 40 East Wister Street, Philadelphia 44
Steel Sales Corp., 3348 S. Pulaski, Chicago 23
Superior Oxy-Acetylene Mach. Co., 1102 High St., Hamilton, O.
U. S. Steel Supply Co., 1319 Wabansia Ave., Chicago 90
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Welding Alloys Mfg. Co., 744 Broad St., Newark 2
Weldoloy Mfg. Co., 421 Canal St., New York City
Wooldridge Aluminum Welding Products, Glastonbury, Conn.

WELDING ROD, ALUMINUM BRONZE

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
American Brass Co., 414 Meadow St., Waterbury 88, Conn.
Ampco Metal, Inc., 1745 S. 38th St., Milwaukee 4
Eutectic Welding Alloys Co., 40 Worth St., New York City 13
Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago 7
Special Welding Alloy Co., Inc., 27-33 Jackson, Long Island City, N. Y.
Victor Equipment Co., 844-54 Folsom St., San Francisco 7

WELDING ROD, BRONZE

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
American Brass Co., 414 Meadow St., Waterbury 88, Conn.
Ampco Metal, Inc., 1745 S. 38th St., Milwaukee 4
Bridgeport Brass Co., 30 Grand St., Bridgeport, Conn.
Burdett Oxygen Co., 3300 Lakeside Ave., Cleveland 14
Central Steel & Wire Co., 3000 W. 51st St., Chicago 80
Chase Brass & Copper Co., Inc., 238 Grand St., Waterbury, Conn.
Craftsweld Equip. Corp., 2626 Jackson Ave., Long Island City, N. Y.
Eutectic Welding Alloys Co., 40 Worth St., New York City 13
Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
Marquette Mfg. Co., Inc., 307 E. Hennepin St., Minneapolis 14
Modern Engineering Co., 3401 Pine Blvd., St. Louis
National Cylinder Gas Co., 205 W. Wacker, Chicago 7
Revere Copper & Brass, Inc., 230 Park Ave., New York City
Seymour Mfg. Co., 15 Franklin St., Seymour, Conn.
Special Welding Alloy Co., Inc., 27-33 Jackson, Long Island City, N. Y.
Standard Electrode & Mfg. Corp., 40 East Wister Street, Philadelphia 44
Steel Sales Corp., 3348 S. Pulaski, Chicago 23
Superior Oxy-Acetylene Mach. Co., 1102 High St., Hamilton, O.
Titan Metal Mfg. Co., Bellefonte, Pa.
U. S. Steel Supply Co., 1319 Wabansia Ave., Chicago 90
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Weldoloy Mfg. Co., 421 Canal St., New York City

WELDING ROD, CAST IRON

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
American Agile Corp., 5806 Hough Ave., Cleveland
Atlas Foundry Co., 517 Lyons Ave., Irvington 11, N. J.
Burdett Oxygen Co., 3300 Lakeside Ave., Cleveland 14
Central Steel & Wire Co., 3000 W. 51st St., Chicago 80
The Champion Rivet Co., East 108th & Harvard Ave., Cleveland 5
Chicago Hardware Foundry Co., North Chicago, Ill.
Eastern Welding Equipment Co., 17 West 60th St., New York City 23
Electric Arc, Inc., 152 Jelliff Ave., Newark
Eutectic Welding Alloys Co., 40 Worth St., New York City 13
Harnischfeger Corp., 4400 W. National Ave., Milwaukee 14
Hobart Brothers Co., Troy 1, O.
Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago
Linde Air Products Co., 30 E. 42nd St., New York City 17
Marquette Mfg. Co. Inc., 307 E. Hennepin, Minneapolis 14
McKay Co., York Pa.
Modern Engineering Co., Inc., 3401 Pine Blvd., St. Louis
National Cylinder Gas Co., 205 W. Wacker, Chicago 7
Northeast Metals Company, 4124 Torresdale Ave., Philadelphia 24, Pa.
C. E. Phillips & Co., 2750 Poplar St., Detroit 8
Resisto-Loy Company, 127 Baylis S.W., Grand Rapids 7, Mich.
A. O. Smith Corp., 27th & Hopkins, Milwaukee
Special Welding Alloy Co., 27-33 Jackson, Long Island City, N. Y.
Standard Steel & Wire Co., Bolivar, Pa.
Steel Sales Corp., 3348 S. Pulaski, Chicago 23
Superior Oxy-Acetylene Mach. Co., 1102 High St., Hamilton, O.
U. S. Steel Supply Co., 1319 Wabansia Ave., Chicago 90
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Weldoloy Mfg. Co., 421 Canal St., New York City

WELDING ROD, COPPER

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Alloy Specialties Co., 2441 Waverly Ave., Swissvale, Pa.
American Brass Co., 414 Meadow St., Waterbury 88, Conn.
Ampco Metal, Inc., 1745 S. 38th St., Milwaukee 4
Bridgeport Brass Co., 30 Grand St., Bridgeport, Conn.
Central Steel & Wire Co., 3000 W. 51st St., Chicago 80
Chase Brass & Copper Co., Inc., 238 Grand St., Waterbury, Conn.
Eastern Welding Equipment Co., 17 West 60th St., New York City 23
Eutectic Welding Alloys Co., 40 Worth St., New York City 13
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
Marquette Mfg. Co. Inc., 307 E. Hennepin St., Minneapolis 14
Modern Engineering Co., Inc., 3401 Pine Blvd., St. Louis
National Cylinder Gas Co., 205 W. Wacker, Chicago 7
Perry Equip. & Supply Co., 1515 W. Thompson, Philadelphia
Revere Copper & Brass, Inc., 230 Park Ave., New York City
Special Welding Alloy Co., Inc., 27-33 Jackson, Long Island City, N. Y.
Superior Oxy-Acetylene Mach. Co., 1102 High St., Hamilton, O.
U. S. Steel Supply Co., 1319 Wabansia Ave., Chicago 90
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Welding Engrg. Co., 264 E. Ogden, Milwaukee 2
Weldoloy Mfg. Co., 421 Canal St., New York City
Williams & Co., Inc., 901 Pennsylvania Ave., Pittsburgh

WELDING ROD, HARD-FACING

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Allied Weldcraft, Inc., 601 Kentucky Ave., Indianapolis
American Agile Corp., 5806 Hough Ave., Cleveland
American Manganese Steel Div., of American Brake Shoe Co., 389 E. 14th St., Chicago Heights, Ill.
Bergstrom Alloy Corp., Reno, Nev.
Callite Tungsten Corp., 549 Thirty-ninth St., Union City N. J.
Central Steel & Wire Co., 3000 W. 51st St., Chicago 80
Chicago Hardware Foundry Co., North Chicago, Ill.
Coast Metals, Inc., 1232 Camden Ave., S. W., Canton 6, O.
Delloy Metals, 3rd and Huntingdon, Philadelphia
Diamalloy Company, The, Gowanda, N. Y.
Dymonhard Corp., 250 W. 57th St., New York City
Eastern Welding Equipment Co., 17 W. 60th St., New York City 23
Eutectic Welding Alloys Co., 40 Worth St., New York City 13
Harnischfeger Corp., 4400 W. National Ave., Milwaukee 14
Haynes Stellite Co., 30 East 42nd St., New York City 17
Kerk-Aloy Co., Bloomington, Ind.
Lincoln Electric Co., 12818 Coit Rd., Cleveland 1
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
Marquette Mfg. Co., Inc., 307 E. Hennepin St., Minneapolis 14
Modern Engineering Co., Inc., 3401 Pine Blvd., St. Louis
National Cylinder Gas Co., 205 W. Wacker, Chicago 7
Osage Metal Co., Inc., Oklahoma City, Okla.
Resisto-Loy Co., 127 Baylis St., S. W., Grand Rapids 7, Mich.
A. O. Smith Corp., 27th & Hopkins, Milwaukee
Special Welding Alloy Co., Inc., 27-33 Jackson, Long Island City, N. Y.
Standard Steel & Wire Co., Bolivar, Pa.
Steel Sales Corp., 3348 S. Pulaski, Chicago 23
Steody Co., 1135 W. Slauson Ave., Whittier, Calif.
Stulz-Sickles Co., 134-42 Lafayette St., Newark 5
Superior Oxy-Acetylene Mach. Co., 1102 High St., Hamilton, O.
U. S. Steel Supply Co., 1319 Wabansia Ave., Chicago 90
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Wall-Colmonoy Corp., 720 Fisher Bldg., Detroit 2
Wilson Welder & Metals Co., Inc., 60 E. 42nd St., New York City 17

WELDING ROD, INCONEL

Eutectic Welding Alloys Co., 40 Worth St., New York City 13
International Nickel Co., Inc., 67 Wall St., New York City 5
Modern Engineering Co., Inc., 3401 Pine Blvd., St. Louis
Steel Sales Corp., 3348 S. Pulaski, Chicago 23
Victor Equipment Co., 844-54 Folsom St., San Francisco 7

WELDING ROD, MAGNESIUM

American Magnesium Corp., 1706 Gulf Bldg., Pittsburgh
Dow Chemical Co., The, Midland, Mich.
Modern Engineering Co., Inc., 3401 Pine Blvd., St. Louis

WELDING ROD, MANGANESE

American Agile Corp., 5806 Hough Ave., Cleveland
American Manganese Steel Div. of America Brake Shoe Co., 389 E. 14th St., Chicago Heights, Ill.
Central Steel & Wire Co., 3000 W. 51st St., Chicago 80
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
Marquette Mfg. Co., Inc., 307 E. Hennepin St., Minneapolis 14
Standard Steel & Wire Co., Bolivar, Pa.
Steel Sales Corp., 3348 S. Pulaski, Chicago 23
Steody Co., 1135 W. Slauson Ave., Whittier, Calif.
Stulz-Sickles Co., 134-142 Lafayette St., Newark 5
Taylor Wharton Iron & Steel Co., Easton, Pa.
U. S. Steel Supply Co., 1319 Wabansia, Chicago 90

WELDING ROD, MONEL

Electric Arc, Inc., 152 Jelliff Ave., Newark
Eutectic Welding Alloys Co., 40 Worth St., New York City 13
International Nickel Co., Inc., 67 Wall St., New York City 5
Modern Engineering Co., Inc., 3401 Pine Blvd., St. Louis
Steel Sales Corp., 3348 S. Pulaski, Chicago 23
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Williams & Co., Inc., 901 Pennsylvania Ave., Pittsburgh

WELDING ROD, NICKEL

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Electric Arc, Inc., 152 Jelliff Ave., Newark
Eutectic Welding Alloys Co., 40 Worth St., Newark 13
Harnischfeger Corp., 4400 W. National Ave., Milwaukee 14
Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago
International Nickel Co., Inc., 67 Wall St., New York City 5
Marquette Mfg. Co., Inc., 307 E. Hennepin St., Minneapolis 14
Modern Engineering Co., Inc., 3401 Pine Blvd., St. Louis
National Cylinder Gas Co., 205 W. Wacker, Chicago 7
Standard Steel & Wire Co., Bolivar, Pa.
Steel Sales Corp., 3348 S. Pulaski, Chicago 23
Superior Oxy-Acetylene Mach. Co., 1102 High St., Hamilton, O.
Victor Equipment Co., 844-54 Folsom St., San Francisco 7

WELDING ROD, STAINLESS

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Allegheny Ludlum Steel Corp., Brackenridge 2, Pa.
Allied Weldcraft, Inc., 601 Kentucky Ave., Indianapolis
Alloy Rods Co., 501 E. Prospect St., York, Pa.
American Steel & Wire Company, 614 Superior Ave., N. W., Cleveland
Arcos Corp., 401 N. Broad St., Philadelphia
Central Steel & Wire Co., 3000 W. 51st St., Chicago 80
Crucible Steel Co. of America, New York City
Electric Arc, Inc., 152 Jelliff Ave., Newark
Eutectic Welding Alloys Co., 40 Worth St., New York City 13
Harnischfeger Corp., 4400 W. National Ave., Milwaukee 14
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
Marquette Mfg. Co., Inc., 307 E. Hennepin St., Minneapolis 14
McKay Co., York, Pa.
Modern Engineering Co., Inc., 3401 Pine Blvd., St. Louis
National Cylinder Gas Co., 205 W. Wacker, Chicago 7
Page Steel & Wire Div., American Chain & Cable Co., Inc., Monessen, Pa.
Rail Supply Co., 110 E. 42nd St., New York City 17
Reid-Avery Co., Cleveland and Chesapeake Ave., Baltimore 22
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago
A. O. Smith Corp., 27th & Hopkins, Milwaukee
Special Welding Alloy Co., Inc., 27-33 Jackson, Long Island City, N. Y.
Standard Electrode & Mfg. Corp., 40 East Wister Street, Philadelphia 44
Steel Sales Corp., 3348 S. Pulaski, Chicago 23
U. S. Steel Supply Co., 1319 Wabansia Ave., Chicago 90
Victor Equipment Co., 844-54 Folsom St., San Francisco 7

WELDING ROD, STEEL, MILD

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Allied Weldcraft, Inc., 601 Kentucky Ave., Indianapolis
American Agile Corp., 5806 Hough Ave., Cleveland
American Rolling Mill Co., Middletown, O.
American Steel & Wire Co., 615 Superior Ave., N. W., Cleveland
Bethlehem Steel Co., Bethlehem, Pa.
Capitol Steel Corp., 15 E. 40th St., New York City
Anthony Carlin Co., 2717 E. 75th St., Cleveland
Central Steel & Wire Co., 3000 W. 51st St., Chicago 80
Craftsweld Equipment Corp., 2626 Jackson Ave., Long Island City 1, N. Y.
Electric Arc, Inc., 152 Jelliff Ave., Newark
Eutectic Welding Alloys Co., 40 Worth St., New York City 13
General Electric Co., Schenectady 5, N. Y.
Harnischfeger Corp., 4400 W. National Ave., Milwaukee 14
Hobart Bros. Co., Troy 1, O.
Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
Marquette Mfg. Co., Inc., 307 E. Hennepin, Minneapolis 14
McKay Co., York, Pa.
Modern Engineering Co., Inc., 3401 Pine Blvd., St. Louis
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago 7
Page Steel & Wire Div., American Chain & Cable Co., Inc., Monessen, Pa.
Reid-Avery Co., Cleveland and Chesapeake Ave., Baltimore 22
A. O. Smith Corp., 27th & Hopkins, Milwaukee
Special Welding Alloy Co., Inc., 27-33 Jackson, Long Island City, N. Y.
Standard Electrode & Mfg. Corp., 40 East Wister St., Philadelphia 44
Standard Steel & Wire Co., Bolivar, Pa.
Steel Sales Corp., 3348 S. Pulaski, Chicago 23
Superior Oxy-Acetylene Mach. Co., 1102 High St., Hamilton, O.
Trindl Products, Ltd., 17 E. 23rd St., Chicago 16
U. S. Steel Supply Co., 1319 Wabansia Ave., Chicago 90
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Westinghouse Elec. & Mfg. Co., E. Pittsburgh

WELDING ROD, TOOL & DIE

American Agile Corp., 5806 Hough Ave., Cleveland
American Manganese Steel Div. of American Brake Shoe Co., 389 E. 14th St., Chicago Heights, Ill.
Central Steel & Wire Co., 3000 W. 51st St., Chicago 80
Dymonhard Corp., 250 W. 57th St., New York City
Electric Arc, Inc., 152 Jelliff Ave., Newark
Eutectic Welding Alloys Co., 40 Worth St., New York City 13
Harnischfeger Corp., 4400 W. National Ave., Milwaukee 14
McKay Co., York, Pa.
Modern Engineering Co., Inc., 3401 Pine Blvd., St. Louis
Resisto-Loy Company, 127 Baylis, S. W., Grand Rapids 7, Mich.
Steel Sales Corp., 3348 S. Pulaski, Chicago 23
U. S. Steel Supply Co., 1319 Wabansia Ave., Chicago 90
Universal Power Corp., 4899 Euclid Ave., Cleveland 3
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Welding Equipment & Supply Co., 223 Leib St., Detroit 7
Williams & Co., Inc., 901 Pennsylvania Ave., Pittsburgh

WELDING ROD, WHITE METAL

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Aladdin Rod & Flux Mfg. Co., Box 935, Madison Sq. Sta., Grand Rapids 7, Mich.
Central Steel & Wire Co., 3000 W. 51st St., Chicago 80
Eutectic Welding Alloys Co., 40 Worth St., New York City 13
Modern Engineering Co., Inc., 3401 Pine Blvd., St. Louis
National Cylinder Gas Co., 205 W. Wacker, Chicago 7
Special Welding Alloy Co., Inc., 27-33 Jackson, Long Island City, N. Y.
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Weldit Acetylene Co., 638 Bagley Ave., Detroit 26

WELDING TORCHES, GAS

(See "TORCHES")

WELDING WIRE, AUTOMATIC

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Aluminum Company of America, Gulf Bldg., Pittsburgh
Central Steel & Wire Co., 3000 W. 51st St., Chicago 80
Electric Arc, Inc., 152 Jelliff Ave., Newark
Eutectic Welding Alloys Co., 40 Worth St., New York City 13
General Electric Co., Schenectady 5, N. Y.
Lincoln Electric Co., 12818 Coit Rd., Cleveland 1
Linde Air Products Co., The, 30 E. 42nd St., New York City 17
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago 7
Rail Supply Co., 110 E. 42nd St., New York City 17
Reid-Avery Company, Cleveland and Chesapeake Ave., Baltimore 22
A. O. Smith Corp., 27th & Hopkins, Milwaukee
Standard Steel & Wire Co., Bolivar, Pa.
Steel Sales Corp., 3348 S. Pulaski, Chicago 23
Una Welding, Inc., 1615 Collamer Ave., Cleveland 10
U. S. Steel Supply Co., 1319 Wabansia Ave., Chicago 90
Victor Equipment Co., 844-54 Folsom St., San Francisco 7
Wilson Welder & Metals Co., Inc., 60 E. 42nd St., New York City 17

WIRE-FORMING MACHINES

Air Reduction Sales Co., 60 E. 42nd St., New York City 17
Electric Arc, Inc., 152 Jelliff Ave., Newark
Mosio Machinery Co., 2443 Prospect Ave., Cleveland 15

WIRE, METALLIZING

Metallizing Co. of America, 1330 W. Congress, Chicago 7
Metallizing Engineering Co., Inc., 38-14 30th St., Long Island City, N. Y.
Standard Steel & Wire Co., Bolivar, Pa.

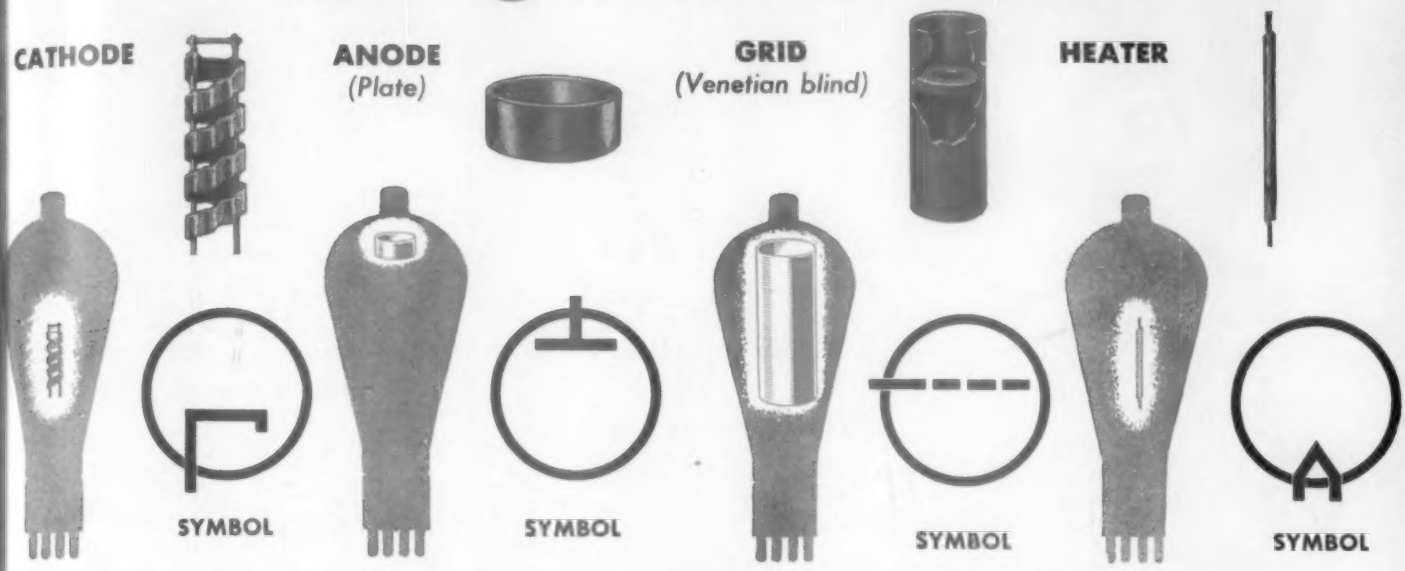
X-RAY EQUIPMENT

Bar-Ray Products, Inc., 209 25th St., Brooklyn 32, N. Y.
Eastman Kodak Co., X-Ray Div., Rochester 4
General Electric X-Ray Corp., 2012 W. Jackson, Chicago 12
Kelley-Koett Mfg. Co., 212 W. 4th St., Covington, Ky.
North American Philips Co., Inc., 100 East 42nd St., New York City 17
Picker X-Ray Corp., 300 4th Ave., New York City 10
Ray Proof Corp., 330 East 26th St., New York City
Westinghouse Elec. & Mfg. Co., X-Ray Div., Baltimore

X-RAY AND RADIUM PROTECTION

Bar-Ray Products, Inc., 209 25th St., Brooklyn 32, N. Y.
Ray Proof Corp., 330 East 26th St., New York City

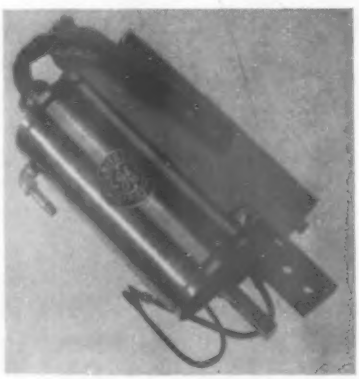
Welding Control Tubes



Every electronic tube has four basic parts: a surface which gives off electrons (cathode), a surface which receives electrons (anode), a glass or metal envelope (the "outside") and terminals for connecting the tube into the circuit. The thyratron tube pictured above has two additional basic parts: the grid which controls the current passing through the tube and a heating coil to raise the temperature of the cathode in order to "boil" electrons off the cathode. This particular thyratron is not used in resistance welding, but it serves to illustrate the principal details of such tubes generally.

These Tubes Are Used in Resistance Welding

Ignitron



Basic to resistance welding control is the well known IGNITRON, a mercury-vapor tube with an ignitor and a mercury-pool cathode. It is a high-capacity rectifier of alternating currents. In most electronic welding controls, a pair of ignitron tubes are used in the transformer primary circuit as an inertialess, noiseless single-pole switch. The ignitron is a heavy-duty tube that is capable of handling large amounts of power.

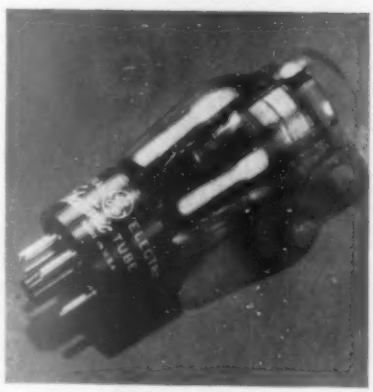
Thyratron

The ignitron tube must itself be controlled and hence the THYRATRON, which is used in resistance welding for various timing and control functions. The thyratron serves as a firing tube for the ignitor circuit of ignitron tubes. The type shown here differs from the one pictured in the two-color illustration in that it has an additional grid (shield grid), which permits the use of much higher resistance circuits for the tube's control.

Phanotron

The PHANOTRON is a hot-cathode, gas-filled tube without a grid. In resistance welding, small phanotron tubes are used as rectifiers to provide d-c power for various timing circuits and for d-c control voltage. Larger sizes are used to convert a-c to d-c for d-c operated contactors and solenoids and for charging capacitors in energy storage welding.

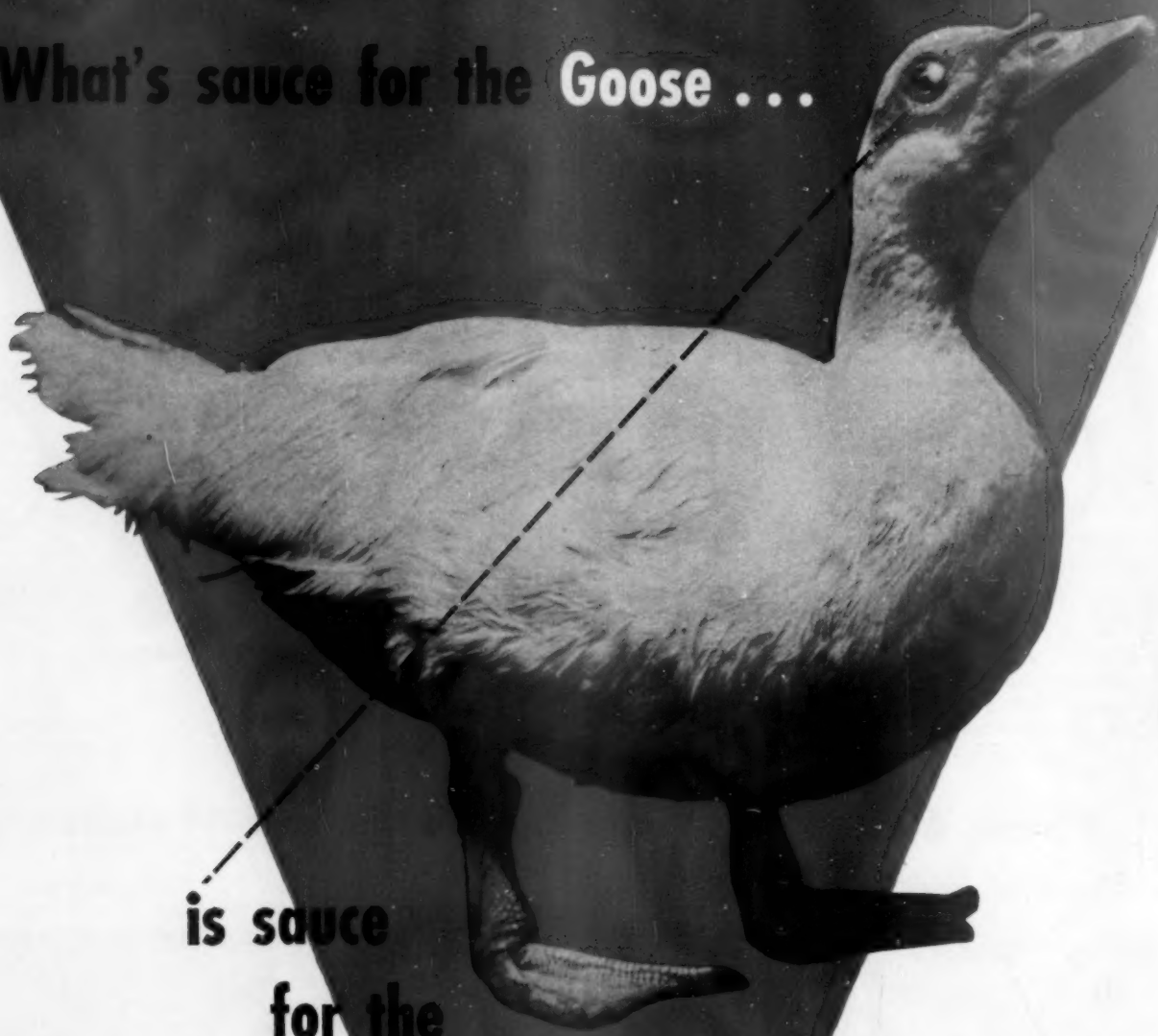
Glow Tube



A cold-cathode, gas-filled tube without a grid, the GLOW TUBE functions as a voltage regulator. In resistance welding, glow tubes are used to hold the constant d-c voltages which are needed in electronic timing circuits to assure accurate timing.

Illustrations, courtesy of General Electric Co.

What's sauce for the Goose . . .



is sauce for the Gander

And that applies to welding, too!

For production men agree that Electric Arc Welding —now contributing so essentially to America's wartime production—will play an equally vital part in the manufacturing processes of an approaching peacetime economy. This is just another reason why the **McKay** line of **Stainless, Alloy or Mild Steel Welding Electrodes** —now used nearly 100% for war—is being constantly improved and perfected in one of the nation's leading research institutes. When "Re-Conversion Day" comes McKAY ELECTRODES will be ready and will embrace the improved metallurgical characteristics required by production-for-peace applications.

Now is the time to ask this 60 year old manufacturer to help you adapt electric arc welding to your present as *well* as to your future needs. McKAY engineers are at your service.

The McKAY line—including **McKay Commercial Chain** for every industrial, maritime or agricultural requirement; and **McKay Tire Chains,** too—will serve you well, both today and in countless applications tomorrow. Let's get better acquainted.

General Sales Office: York, Penna.

THE McKAY COMPANY
PITTSBURGH, PA.

WELDING ELECTRODES . . . COMMERCIAL CHAINS . . . TIRE CHAINS

On the Job

Cracking Eliminated

THE HUGE Pratt and Whitney engine that is the power plant of the world's fastest single-seat fighting plane—the Thunderbolt P-47—rides on a fragile-appearing tubular section which, needless to say, must be perfection itself. It is easy to imagine

Welding ring and cowl brackets on engine mounts for P-47 Thunderbolts. Note the use of the preheating torch to avoid cracks due to unequal contraction and expansion.

what the least defect in the engine mount could mean to a plane and pilot racing at more than 400 mph in substratosphere altitudes of 30,000 to 40,000 feet.

To safeguard against failures, such exacting standards of inspection are required that even contractors experienced in peacetime welding techniques have found it exceedingly difficult to build engine mounts which would pass. In particular, repeated rejections of the mounts were made because of cracks developed during welding.

The causes of the cracks, it was found by the Aviation Division of Carrier Corp., fell into three categories: first, welding technique; second, unequal contraction and expansion of the heavy and light parts welded together; third, temperature and humidity variations in the welding room.

The first difficulty was overcome by proper instruction; weldors, for instance, were trained to start the weld slightly in advance of the bracket and clip to be welded. Contraction and expansion were controlled by preheating to approximately 300 F. And the third cause was right down Carrier's particular alley as this firm in peacetime is an important manufacturer of air conditioning equipment.

Carrier's welding experts decided upon the use of an a-c transformer-type welder with an ionizer attached. This combination simplified the striking of the arc, got rid of arc blow in tube clusters and tight corners and made for improved control of the amperage setting.

Repair on the High Seas

AN EXPERIENCE that is typical of the resourcefulness being displayed by Navy Seabees is related by George Chitarovich, who is now somewhere in New Guinea. Reported Mr. Chitarovich:

"When ten miles from shore, an 'incident happened'—well, anyway a hole was blown in the side of our Navy LST (landing ship-tank) just two feet above the water line. The C.O. called me on the job to determine whether we could make the repair en route or would have to put in for shore. I asked permission to attempt the repair at once.

Since the hole was very rough and jagged, I first burnt it out to an opening five feet square. I had counted on using a patch of armor plate but found that the latter was in the hold of the ship and impossible to get at. So we cut up one of the pontoons we carry on deck (they are ¼ in. thick) and did a leakproof job of welding.

"Then I suggested to the officer in charge that we weld another pontoon plate on the inside to reinforce the first. The reinforcement would be needed, I believed, because the patch would be from 2 to 4 feet below the water line with a deck load twice that which we were then carrying. The second plate was welded under very tough conditions as the ship was heaving around from the swells of the sea.

"Later on, I was asked why I had put the reinforcing plate on the inside rather than on the outside and overlapping the first plate. My answer was that there was not much pressure on the plate itself, and I was anxious to do a neat job on the patch. These boys of the LST's are mighty proud of their ships, and we Seabees are just as proud of our work. If the plate had been lapped on the outside, it would have really looked like a patch job. As it is, it is almost impossible for anyone to observe that we were ever the victims of an 'incident.'"

» «

Welded Electric Furnace

ARC WELDING was used to fabricate a 15 ton electric furnace needed to produce special alloy steels for the war effort. The furnace shell and various other parts are made of steel plates fused together by arc

Courtesy, The Lincoln Electric Co.

Welded furnace to produce alloy steels.

welding, we are informed by Anthony Jessome, welding operator of Torrance, Calif.

The furnace is used to make chrome-nickel, chrome-moly, manganese and other superhard, supertough steels for war purposes. The fact that it is subjected to extreme heating temperatures for periods of three to four hours at a time well attests to the ability of welding to withstand pressure, corrosion and wide variations in temperature.

Official U. S. Navy Photograph, Courtesy of Hobart Brothers Co.

Side by side, two of the Navy's new landing ship-tanks (LST) unload their cargoes of war on Rendova Island in the central Solomons. The welded repair described above was made on a ship like these.

Giving Tanks a Toe-Hold

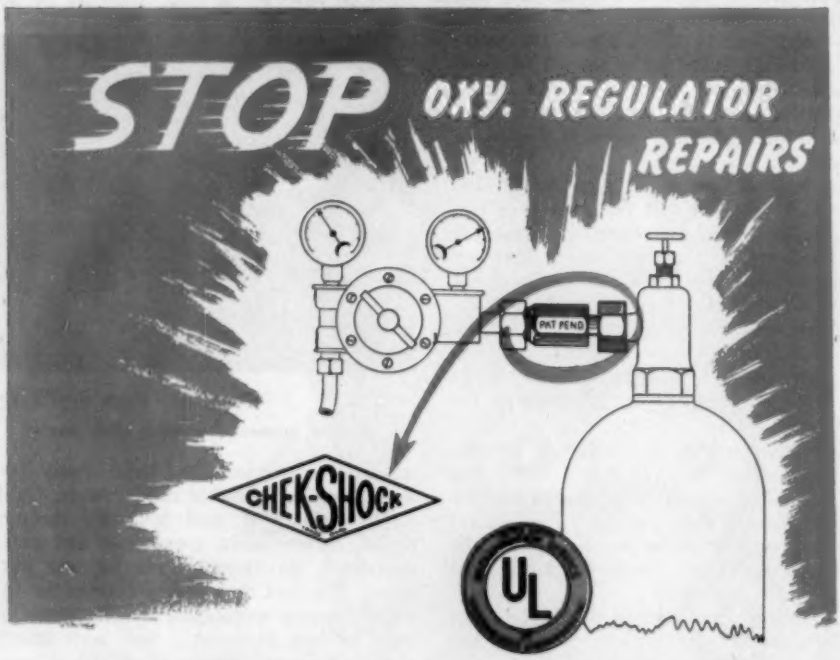
WHEN tank-carrying invasion barges touch an enemy beach, the tanks must be able to "dig in their toes" in order to sprint from their carriers with the greatest possible speed. Slipping or skidding of the tank treads on the floors of the carriers might cause a delay that would be fatal to the success of a landing operation. To prevent it, traction bars are welded in parallel rows to the barge floor plates.

A-c welders are used for this job "because we can work in corners without trouble from arc blow," says M. W. Ulmer, assembly yard welding foreman of the Maywood, Calif., plant of the Consolidated Steel Corp. All-position a-c electrodes (E-6013 class) are employed.

Courtesy, General Electric Co.

Traction bars being welded to the floor plates of tank-carrying invasion barges at the Maywood, Calif., plant of the Consolidated Steel Corp.

THIS IS IT!



— CHEK-SHOCK Oxygen CUSHION Valve —

Will allow tank valve to be opened rapidly without damage to regulator or danger to operator.

Will prevent unnecessary internal wear in regulator *(as, NOT necessary to release control screw before opening tank valve).*

Will eliminate possible injury to operator from burstings.

Will increase life of regulator assembly.

This NEW automatic safety device CUSHIONS the initial BLAST of pressure when tank valve is turned on *(this uncontrolled surge which strikes like a hammer, is the direct cause of most damaged regulators and accidents).* Thereafter pressure slowly equalizes and then CHEK-SHOCK allows a full flow of oxygen.

ONLY ONE MOVING PART, POSITIVELY FOOLPROOF

PRICE IS LESS THAN ONE REPAIR BILL

Universal coupler type (will fit any oxygen regulator).....$6.00 each
Screw-in type (for removable inlet stem regulators only)....$5.00 each

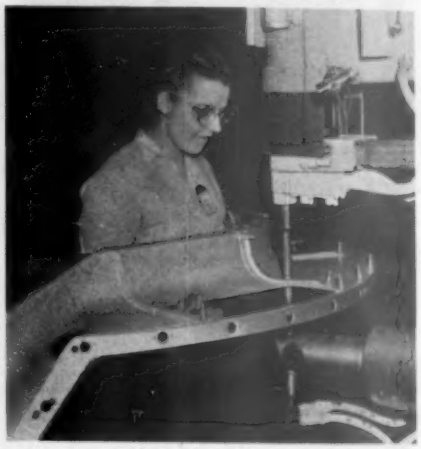
— OPENINGS FOR DEALERSHIPS —

Send orders with M. R. O. to

Safety Shock Manufacturing Co.
FOWLER, CALIFORNIA

Refrigerated Electrodes

IMPROVED quality, stepped-up output and a definite increase in the numbers of welds obtained between electrode dressings are some of the results reported by the various aircraft plants which are using refrigerated spot-welding electrodes for joining aluminum sheets.



Courtesy, Frostrode Products

Aircraft subassemblies being spot welded at Eastern Aircraft with refrigerated electrodes.

At Chance-Vought Aircraft, refrigeration has made possible 20 to 30% more spots per cleaning. An Ohio aircraft company found that the increase of spots possible between dressings ranged from between 100 to 150%.

When welding sheets or small parts of thin non-ferrous alloys, the Murray Corp. learned that refrigerating the electrodes increased machine output to as high as 3 to 1 ratio—from 50 to 150 spots between dressings. On 0.091 in. stock, the number of welds was doubled by refrigeration.

Southern Aircraft Corp. estimates that the use of refrigerated electrodes allows them to make as high as four times as many welds between tip dressings. Curtiss-Wright also reports more welds per dressing for sub-freezing coolant temperatures.

These results have been obtained on aluminum alloys and alclad sheets varying in thickness from 0.012 to 0.125 in. In general, a cooling temperature of around zero F has been found safe and efficient for most gauges of aluminum stock.

Brazing Circumferential Ring on large Expansion Joint with SIL-FOS.

Brazing a Low Hub Flange to the Expansion Joint with EASY-FLO No. 3.

Joining Back and Throat with EASY-FLO No. 3 to form the Intake Pipe.

YES, ON BIG STUFF TOO

IT PAYS TO BRAZE WITH THE SILVER ALLOYS · SIL-FOS · EASY-FLO · EASY-FLO No. 3

The fact that these low-temperature, free-flowing alloys make possible the fast, economical production of amazingly strong, reliable, leak-proof joints, is well established throughout the Marine field—established by universal use in the making of all kinds of Marine equipment and in the construction of ships' piping systems.

And evidence is mounting in Marine Copper Shops, where these alloys have replaced spelter brazing in fabricating large copper piping like the big intake illustrated, that their use is just as advantageous and just as economical on this larger work.

THIS BULLETIN WILL GIVE YOU THE STORY

It covers fully the silver alloy brazing procedure with which even inexperienced operators can fabricate the copper piping and piping combinations commonly used in the Marine field. Write for your copy today.

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Agents in Principal Cities

Practical Conservation of Metals with Amsco Welding Products . .

Welding engineers and welders have earned more credit than they have received in the metal conservation program. Many of them have been aided by Amsco Welding Products with which a little metal has often saved a lot.

Amsco Nickel-Manganese Steel Welding Rod for building up worn away portions of manganese steel and carbon steel parts requiring high tensile strength and ductility; and for tacking on and filling in around Amsco Filler Bars, Shapes and Repointers.

Amsco Mo-Mang Welding Rod for building up manganese steel and carbon steel parts subjected to impact and abrasion.

Amsco No. 459 Welding Rod for hard-surfacing parts subjected to severe abrasion and moderate impact.

Amsco No. 217 Welding Rod for hard-surfacing parts subjected to extreme abrasion, and abrasion at moderately elevated temperatures.

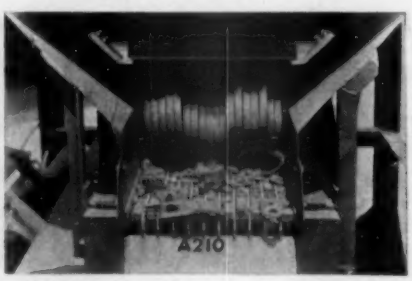
Amsco Economy Hardface for parts subjected to severe impact and abrasion.

Amsco Dieweld for repairing forging dies, trimmers, punches; for making composite dies; for restoring worn edges of cutting tools and for tipping on a cutting edge on mild steel.

Amsco Nickel-Manganese Steel Filler Bars and Special Shapes for use where large amounts of metal are required to reinforce thin sections; also for repairing worn tractor treads or grousers.

Amsco Dipper Teeth Repointer Bars for quickly restoring worn manganese or carbon steel dipper teeth to original dimensions. Also used to add life to bucket lips, etc.

Ask for Bulletin 941-W on Amsco Welding Products.



Metal Savings Pictured

10-H—Dredge cutterhead given added service life by building up the worn blades with Amsco Repointer Bars, welded on with Amsco Nickel-Manganese Steel build-up rod.

A-210—Periodic application of Amsco No. 459 Hard Surfacing Welding Rod more than doubled the service life of the walking grids of this Royer foundry shakeout unit.

Amsco
AMERICAN MANGANESE STEEL DIVISION
Chicago Heights, Illinois
FOUNDRIES AT CHICAGO HEIGHTS, ILL.; NEW CASTLE, DEL.; DENVER, COLO.; OAKLAND, CALIF.; LOS ANGELES, CALIF.; ST. LOUIS, MO.
OFFICES IN PRINCIPAL CITIES

AMERICAN Brake Shoe COMPANY

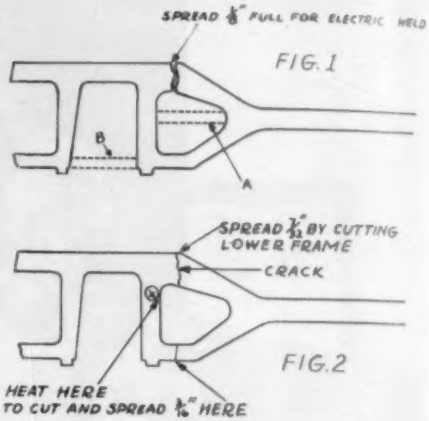
Locomotive Frame Repair

By ***FRANK O. STOLPE***

Duluth, South Shore & Atlantic Railroad

WELDING locomotive frames in position is done by both electric and oxy-acetylene methods. When the break occurs as shown in Fig. 1, we find that arc welding is the better method of repair.

The break is spread a full ⅛ in. by the use of the spreader, "A." Another spreader, "B," can be used if the part is very rigid,



Courtesy, Harnischfeger Corp.

Arc-welding (Fig. 1) and oxy-acetylene (Fig. 2) methods of effecting the repair of a broken locomotive frame.

but heating of the frame to get the necessary expansion should be avoided. After spreading, the irregular break is cut as straight and narrow as possible.

Using E-6012 poor fit-up electrodes, 5 in. passes are made through the 4 in. frame. This leaves a ½ in. boss on each side. Alternate passes from inside to outside are made to get the side walls thoroughly penetrated. Cleaning is done after each pass.

Fig. 2 shows how the same job would be handled with oxy-acetylene welding. The arc-welding method as used in Fig. 1 cuts labor costs in half and requires only one quarter the amount of electrodes.

» «

Hair Protection for Women

IN PLANTS employing large numbers of women, the problem of protecting the ladies' hair from contact with moving machinery is becoming increasingly important as more and more women are being employed by industry to operate machines. Many moving machine parts or parts being machined cannot be guarded because of the nature of the work; hence there is a definite need for positive head protection. According to the National Safety Council, Inc., the "dust cap," hair nets, bandanas and turbans sometimes worn for assembly work in factories are *not* safe for machine operators. Instead, there should be worn a safety hat or cap which (1) completely covers the hair, (2) fits snugly enough to stay in place and (3) has a stiff peak and a high, stiff crown which will serve as warning "bumpers." Caps of impermeable, flame-resistant material are recommended to prevent burns from sparks and hot metals in welding and grinding operations.

EFFICIENT POSITIONING

. . . Means
BETTER WELDING

. . . and
GREATER OUTPUT

When weldments reach these proportions, Welding Positioners become a necessity, especially when stronger welds and speedy production are essential. Welding large structures on the floor wastes time and reduces welding speed. Crane time, critical in most shops, is lost through much unnecessary handling.

The large photograph shows how a battery of Ransome 16,000 lb. capacity positioners is used in the shops of the Harris Structural Steel Company in New Market, New Jersey. The work shown is a pre-fabricated ship section. Notice the holding cradle which is bolted to the positioner table top. The weldment is quickly clamped to the cradle for all down-hand position welding.

Our engineers will be glad to help with your positioning welding problems. Industrial Division, Ransome Machinery Company, Dunellen, New Jersey.

Method used in a shipyard for welding high pressure pipe.

Subsidiary of **WORTHINGTON**
Pump and Machinery Corporation

Power Plant Equipment • Turbines & Turbo Generator Sets • Diesel & Gas Engines • Pumps and Compressors • Air Conditioning & Refrigerating Equipment • Construction & Mining Machinery • Power Transmission Equipment Liquid Meters

WP4-1

Ransome WELDING POSITIONING EQUIPMENT

Capacities 500-lb. to 40,000-lb., hand-operated and motor-operated . . . Head-stocks and Tail-stocks . . . Turning Rolls

"Two Tone" WELDING

high speed

REPAIRING, REBUILDING AND HARD SURFACING

ON HEAVY DUTY EQUIPMENT

TRACTORS—SHOVELS
ROCK CRUSHERS
BUCKETS—PUMPS

Send for Bulletin No. 7

Resisto-Loy COMPANY
GRAND RAPIDS, MICHIGAN

Putting out Fires

SINCE welding fires are apt to occur now and then through neglect of the proper safety precautions, it is highly desirable to know the quickest and best ways of extinguishing them. According to Safety Research Institute, Inc., New York City, there are three classes of fires, each of which requires its appropriate extinguisher and appropriate fire-fighting technique.

Class A fires are those in ordinary combustible materials—wood, paper, textiles, rubbish, etc. These fires are best put out with water, which has a cooling and quenching effect. Extinguishers which contain water or chemicals-and-water are the soda-acid, foam, pump tank, gas cartridge and loaded stream types.

Class B fires are those in flammable liquids, grease, etc. For these, a blanketing effect is essential in order to cut off the oxygen supply. Suitable extinguishers are foam, vaporizing liquid, carbon dioxide and loaded stream.

Class C fires, those in electrical equipment, require the use of extinguishants which will not damage the equipment nor conduct an electrical charge. Vaporizing liquid and carbon dioxide extinguishers are best for fires of this class. In some cases, however, electrical equipment fires cannot be put out without the quenching and cooling of large quantities of water. In such instances, the equipment should be made electrically dead.

Most incipient fires can be put out in a fraction of a minute if the operator of the extinguisher knows how to use his equipment to the best advantage. In fighting Class A fires, the extinguisher stream should be aimed at the base of what is burning and not at the smoke and flames. After the fire is completely out, the operator should search the remains for glowing embers and drench them.

Flammable liquid fires may be divided into two categories: fires in containers and those in spills. Container fires are, of course, the most difficult to extinguish. If a foam, vaporizing liquid or loaded stream extinguisher is used, the operator should play the stream against the far inside wall of the container, just above the burning surface. If he must remain at a considerable distance from the container, the extinguishant may be directed at a high angle so that it falls lightly on the burning surface. In no case, however, should the stream be directed into the burning liquid.

With carbon dioxide extinguishers, best results are obtained by directing the discharge as close to the burning surface as possible, moving the discharge horn slowly from side to side. The discharge should be continued even after the flames have been extinguished in order to cool the liquid and prevent a possible reflash.

In fighting fires in spills, the operator should first put out the flames nearest to him and then slowly sweep out the fire as he advances along its path.

Fires in electrical equipment should be fought in the same way as fires in ordinary combustible materials. If water or water solution extinguishers are used (they are not recommended for fires of this nature), care must be taken to see that the equipment is electrically dead or a harmful charge may travel up the hose stream.

INCREASE PRODUCTION... ASSURE ABSOLUTE SAFETY

Equip Your A-C Welders with

G-R

VOLT-O-MATIC CONTROL

QUICKLY CONNECTED to *any* alternating current welder, G-R *Volt-o-Matic* control accomplishes these important functions:

1. Automatically reduces open-circuit voltage to *less than 10 volts* during non-welding periods. Welders can change electrodes without a "sting"... even when they're working in the rain!

2. Accurately records arc time in hours and tenths of hours. Readings at end of each shift provide a record of actual arc time for each machine... quickly spot lost time, permitting you to rearrange schedules to get the most out of every welding machine. By checking rod issued, less stubs returned, and comparing net rod used with arc time recorded, you can accurately determine amount of weld metal deposited. Reports from shipyards and other fabricators using G-R *Volt-o-Matic* control show that this "production control" has helped increase welding output as much as 20 per cent!

• • •

Give your welders a break . . . save hours and dollars on welding operations... by equipping your A. C. welders with G-R *Volt-o-Matic* control NOW!

• • •

FOUR MODELS

AC-1... Primary contactor, control relays, G-R *Time-o-Matic* relay with adjustable delay, control transformer and arc time totalizer, all mounted in sturdy weatherproof steel housing and completely wired.

AC-2... Same as above, less time totalizer.

AC-3... Same as AC-1, less primary contactor. (For use where contactors are already installed.)

AC-4... Same as AC-2, less primary contactor.

For use with all A-C welders and all standard line voltages ... Quick and easy to install.

●

NOTE: The *Volt-O-Matic* control is a product of the G-R Electronics Division; it is standard equipment on Model 49 G-R welders; optional on all other G-R models.

See your nearest G-R Distributor

GLENN-ROBERTS COMPANY

1009 FRUITVALE AVENUE, OAKLAND, CALIFORNIA

2107 ADAMS STREET, INDIANAPOLIS, INDIANA

P. O. Box 1814, Washington, D. C.

New Products to Use

Helium Electrode Holder

★ A new helium-shielded electrode holder for manual arc welding of magnesium and its alloys, aluminum, stainless steel, etc., has been announced by the Electric Welding Division of the **General Electric Co.**, Schenectady 5, N. Y. It consists of a Textolite handle,

The new G-E helium-shielded holder for manual arc welding of magnesium. Here welding is done on a light gauge plate.

a steel gas nozzle and a copper electrode clamp fitted with a spring collet. A fixed angle of 76 deg is maintained between the nozzle and the handle.

The electrode clamp is constructed to hold a tungsten or a carbon electrode until it is consumed down to a ¾ in. stub. Between the electrode clamp assembly and the handle is a tapered friction joint designed to facilitate rapid changes of electrode sizes. Electrodes of various sizes may be left in their respective clamps and slipped on the holder without the use of tools.

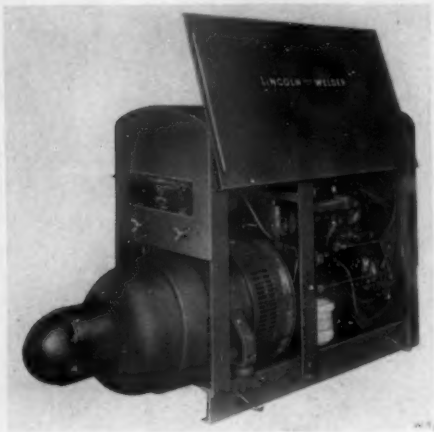
Besides helium, argon gas may be used to protect the metal being welded from the oxidizing effect of the air. The thumb button which controls the gas supply valve provides a smooth, stepless control of the gas flow, enabling the operator to conserve helium when welding in a corner or a depression. The button will remain in either the "on" or "off" position without being held.

» «

Engine-Driven Welder

★ A **"Shield-Arc"** engine-driven d-c welder rated at 200 amp is available in conjunction with an enclosed, rubber-mounted 29 hp engine. The unit, supplied complete with base and canopy, has a current range of 40 to 250 amp. Though designed primarily for metal-arc welding, it also supplies a uniform welding current for carbon-arc welding.

Dual control of the welding current is accomplished by adjustment of series fields and generator speed. The generator control is said to assure accuracy of open circuit voltage and to permit precise control of the engine speed. An engine speed of from 1,150 to 1,400 rpm is used for the majority of welding applications—the rated 200 amp current can be produced with but 1,200 rpm. The control may also be used to reduce the engine speed manually to as low as 750 rpm whenever it is necessary to stop welding at intervals of a few minutes.



This 200 amp welder permits close adjustment of the engine speed to fit the individual job.

Weight of the unit as illustrated is approximately 1,130 lb. **The Lincoln Electric Co.**, Cleveland 1.

» «

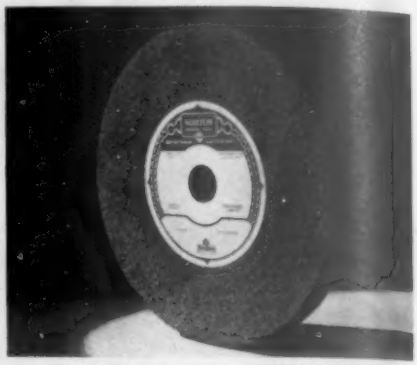
Two-Tone Rods

★ A line of filler rods for the "two-tone" rebuilding and hard-facing process (see page 33) is announced by **The Resisto-Loy Co.**, Grand Rapids, Mich. These include: **"Two-Tone TH,"** a rod for depositing a high strength, medium hard, abrasion-resistant alloy; **"Two-Tone HC,"** a rod for rebuilding high-carbon steel parts; and **"Two-Tone NM,"** a rod for rebuilding manganese steel parts with austenitic nickel-manganese deposits that will harden under impact. In addition, the company manufactures **"Flint type VH"** bare and coated hard-facing electrodes, which give an abrasion- and impact-resistant deposit.

» «

Alundum Grinding Wheels

★ Some time ago an improved aluminum oxide abrasive known as **57 Alundum** was developed in the Norton research laboratories. Tests showed that it was more friable than the regular Alundum abrasive and offered many advantages; the company's production facilities at that time, however, were too limited to allow grinding wheels of this type to be produced for uses other than critical war



Grinding wheel of 57 Alundum. This improved aluminum oxide abrasive is now offered for general use.

jobs. Now production capacity has been increased to a point where 57 Alundum wheels are available for all uses.

These grinding wheels are offered in a wide range of grain sizes, grades and structures. They are said to have a fast, cool cutting action, to hold their shape and to require comparatively few dressings as they tend to keep themselves sharp. Wheels of 57 Alundum, states manufacturer, have been especially successful in crankshaft grinding, where it is important that the wheel corner be able to stand up. **Norton Company**, Worcester, Mass.

» «

Respirator Filters

★ Each of these three types of respirator filters has its own distinctive color, which shows through the transparent filter container of the respirator. Thus inspection at a glance of the filter-type is permitted foremen and safety inspectors. The colors indicate the following types of protection:

Light red: U. S. Bureau of Mines approved protection against all dusts—toxic dusts, lead, cadmium, magnesium, etc.

Light green: protection against fibrosis-producing (silica, asbestos) and pneumoconiosis-producing dusts and mists.

Gray: Bureau of Mines approved protection against toxic fumes from molten metals.

Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh 8.

» «

Synthetic Rubber Gloves

★ Two styles of industrial gloves are now being manufactured from synthetic rubber for anyone who can qualify under Rubber Order R-1. These gloves are said to be as good as natural rubber gloves in their resistance to acids, grease and oil. One glove is of lightweight 0.15 in. gauge material, 10½ in. length, while the other is of 0.30 in. gauge and 14 in. long. Sizes and gauges were carefully worked out to meet the greatest average demand, states manufacturer. **The B. F. Goodrich Co.**, Akron, O.

When *Speed* Counts IT'S MECO EVERY TIME

At a busy intersection—traffic continues to flow—as a ten foot insert is made to repair a sunken and broken rail joint. Meco Speed-Equipment helps "keep 'em running".

VITAL TRANSPORTATION . . . to get war workers to work, is just as essential as providing equipment with which welders can operate. The transportation systems of War Production Localities have done an outstanding job . . . and we are proud that Meco equipment is playing an important part in keeping them "running".

The safety, efficiency, and *above all* the speed with which Meco Welding and Cutting Equipment operates, has enabled transportation to be maintained even under the most difficult conditions.

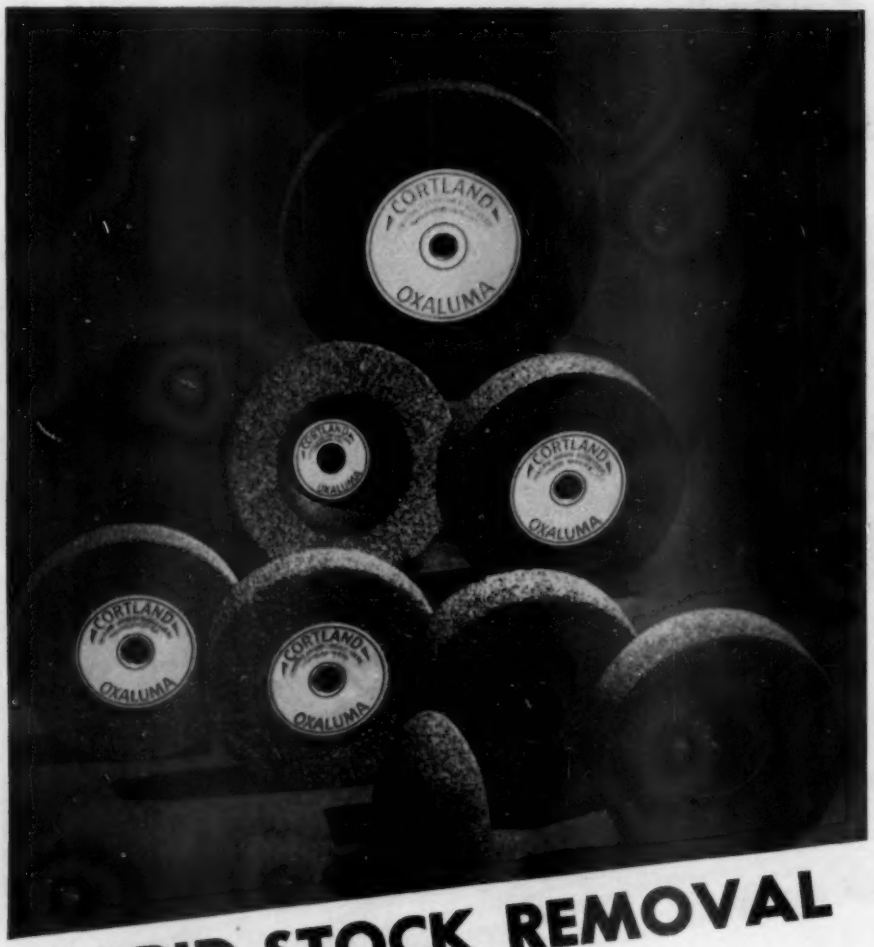
New Catalogue now available. Write for your copy.

Meco

WELDING AND CUTTING EQUIPMENT

MODERN ENGINEERING CO.

3413 PINE BOULEVARD — ST. LOUIS, MISSOURI



RAPID STOCK REMOVAL LONG LIFE - - -

. . . a winning combination you'll always find in Cortland Grinding Wheels. Made in all types and sizes for weld grinding with portable grinders: Vitrified bonded for 6,500 SFM and under; Resinoid bonded for high speeds up to 9,500 SFM.

Cortland has long specialized in wheels for weld grinding, and offers experienced engineering service. Modern production facilities and stocks promote better delivery.

Send in your inquiries to

CORTLAND GRINDING WHEELS CORP.,

15 Cortland Street, Chester, Massachusetts

7-W

for better Weld Grinding

CORTLAND

CORTLAND GRINDING WHEELS CORP. • CHESTER, MASSACHUSETTS

Aluminum-Bronze Electrode

★ Airco announces a new coated aluminum-bronze electrode — **No. 100** — a high tensile bronze electrode which can also be used as a filler rod in carbon arc welding. It is said to produce welding deposits that are superior to standard manganese bronze with respect to corrosion resistance and are equal to it in strength, hardness and ductility.

The new aluminum-bronze electrode has a universal application in the welding of most bronzes, malleable iron, cast iron or steel. In addition, it is especially suited for welding manganese bronze conforming to Federal Specifications QQ-B-726b, or Navy Specifications 49-B-3e for marine propellers and other parts where great strength, ductility and corrosion resistance are strict requirements. Also, it can be used for welding dissimilar metals such as cast iron to brass, steel to malleable iron, etc.

Stock sizes range from ⅛ to ⅞ in. in 14 in. lengths and ¼ in. in 18 in. lengths. **Air Reduction Sales Co.,** 60 E. 42nd St., New York City 17.

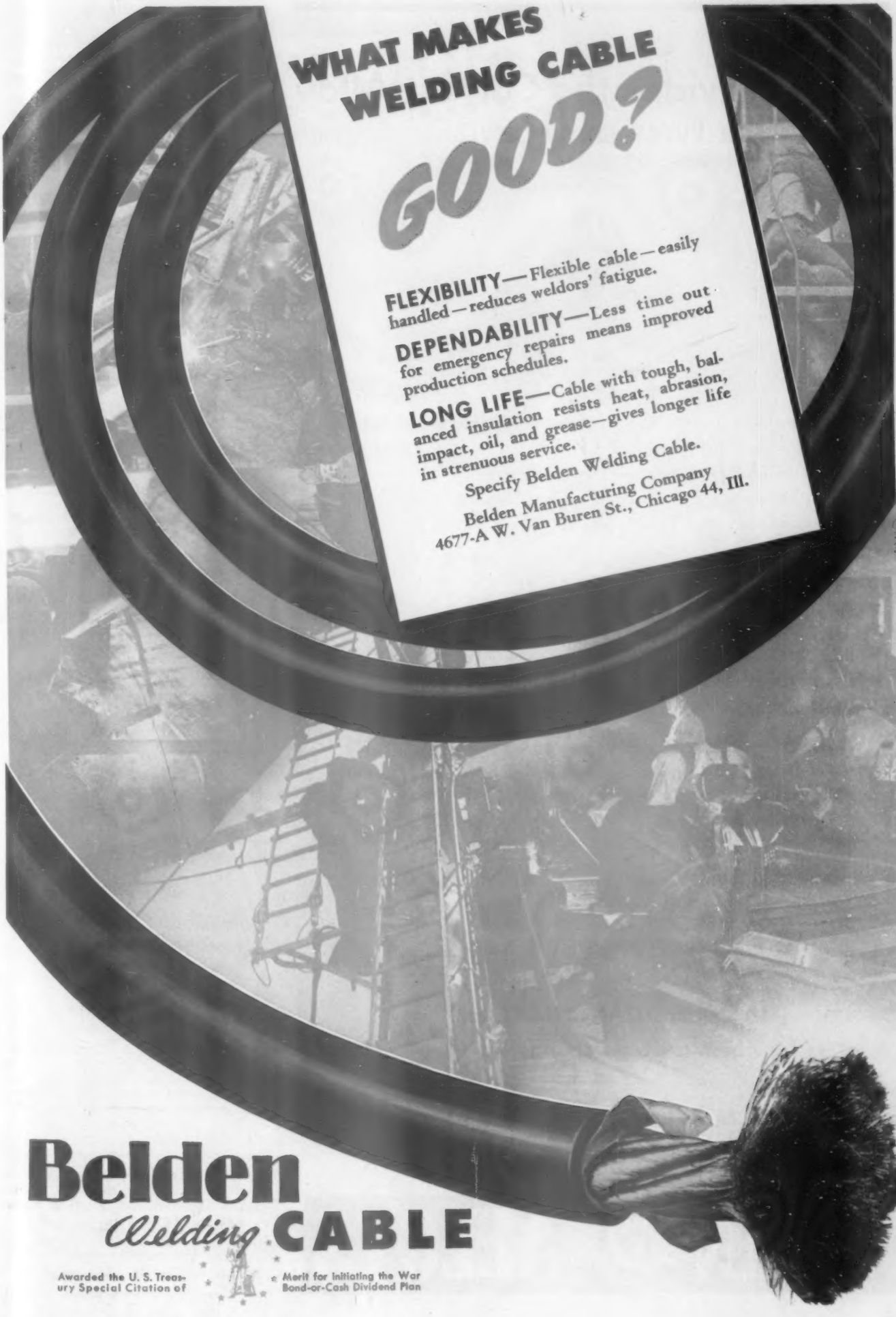
» «

Air Blaster Fan

★ The Chelsea **"Air Blaster"** is a ventilating unit built to deliver a comparatively large volume of high-velocity air in a straight line to the spot where it is needed. The air stream, it is stated, will expand only slightly and continues

The "Air Blaster" is used for directing a comparatively large volume of air to the specific spot where it is needed.

at high velocity over fairly long distances. Thus out-of-way corners and dead air spaces can be reached effectively. The unit is made in three sizes: 18 in., ¾ hp motor, 6,000 cfm capacity; 24 in., 1½ hp motor, 9,000 cfm capacity; 30 in., 1½ hp motor, 11,000 cfm capacity. The welded housing for motor and fan blades is mounted on an adjustable pedestal. **Chelsea Fan & Blower Co., Inc.,** 1206 Grove St., Irvington, N. J.


WHAT MAKES WELDING CABLE GOOD?
FLEXIBILITY—Flexible cable—easily handled—reduces weldors' fatigue.
DEPENDABILITY—Less time out for emergency repairs means improved production schedules.
LONG LIFE—Cable with tough, balanced insulation resists heat, abrasion, impact, oil, and grease—gives longer life in strenuous service.
Specify Belden Welding Cable.
Belden Manufacturing Company
4677-A W. Van Buren St., Chicago 44, Ill.
Belden
Welding CABLE
Awarded the U. S. Treasury Special Citation of
Merit for Initiating the War Bond-or-Cash Dividend Plan

Titan Provides the Correct Alloy

FOR EVERY OXY-ACETYLENE BRONZE-WELDING PURPOSE

TITAN Welding Alloys are all scientifically designed, alloyed and fabricated to produce the best possible results for the purposes recommended. TITAN Alloys are exceptionally low-melting. Absolute uniformity is assured by rigid laboratory control. *Double deoxidation increases the ductility of the weld, reduces fuming to a minimum and assures a sound, dense deposit.*

Titan Alloys are furnished in three distinct groups

- MUNTZ TYPE: General Purpose Rods, for High-strength Ductile Welds.
  PENN BRONZE, doubly-deoxidized, low-fuming; flows at 1628°F.
  TITAN BRAZING BRONZE, flows at 1625°F.
- TIN BRONZES: Hard, Corrosion-resisting; very good on Cast Iron.
  TITAN BRONZE, doubly-deoxidized, low-fuming; flows at 1617°F.
  TITAN NAVAL BRONZE, flows at 1615°F.
  TITAN WEARWELL BRONZE, flows at 1593°F. Special purpose rod possessing great hardness; for building up worn surfaces and for bearing service, etc.
- MANGANESE BRONZES: (General Purpose) Specifically recommended for Cast Iron.
  TITAN MANGANESE BRONZE, doubly-deoxidized, low-fuming; flows at 1617°F.
  TITAN NAVAL MANGANESE BRONZE, flows at 1620°F.

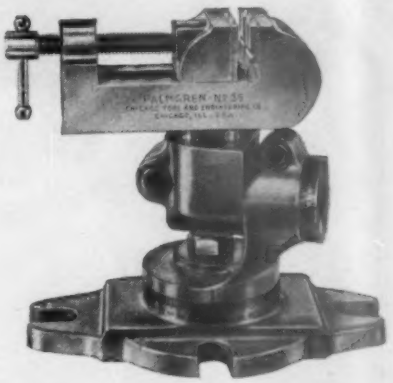
Specify TITAN ALLOYS for best bronze-welding results

TITAN METAL MANUFACTURING CO., BELLEFONTE, PA.

TITAN BRONZE WELDING ALLOYS

Grinder Fixture

★ This chip breaker grinder fixture has three full 360 degree graduated adjustments, making available 1,001 angles.

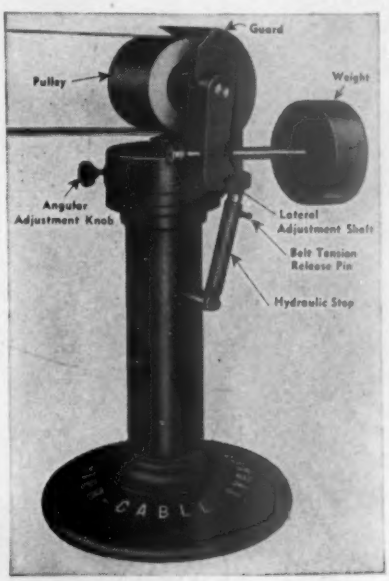


Grinder fixture. It is easily and quickly adjusted for the grinding of small parts.

Any angle can be quickly obtained and positive locking is assured, states manufacturer. The fixture can be used for grinding carbide tip tools, for dressing grinding wheels and for the precision grinding of small parts. **Chicago Tool & Engineering Co.,** 8383 South Chicago Ave., Chicago 17.

Backstand Idlers

★ A new addition to the Porter-Cable line of abrasive belt grinders is the **Model ABS** backstand idler. This is used to adapt grinding and polishing lathes to



This backstand idler is recommended for grinding welds, removing flush, cleaning up, polishing, flat and edge work, etc.

abrasive belt grinding, and it will handle any width of belt up to 6 in. Faster cutting and cooler operation are among the advantages claimed for the endless metal-cutting abrasive belt. **The Porter-Cable Machine Co.,** Syracuse 8, N. Y.

Where to Buy It—See page 59

And *Another* Independent Mobile Oxygen Generator will be under way to a battlefront Air Field

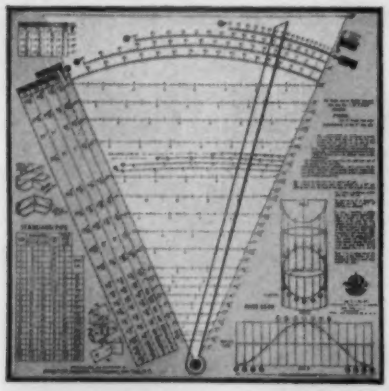
☆ The steady stream of Mobile Oxygen and Hydrogen producing plants going to the armed service is the result of long and accurate planning by Independent Engineers, *pioneer* manufacturers of this type of equipment. Mass production methods were early applied . . . another Independent "First" . . . and the constantly increasing volume of delivery is evidence of Independent's ability to serve efficiently, in war times, and in peace time.

Independent Engineering Co.

101 West Second Street, O'Fallon, Illinois

Angle Meter for Pipe Bends

★ Extending the range of angles of bend up to 126 degrees, the new **"Wolfe"** angle meter is said to enable bends and "Y's" (also multipiece bends) to be laid out directly on the pipe without calculations. The chart measures 12 by 12 in., is printed in three colors, varnished and equipped with a Vinylite pointer. It is available either flat for shop use or folded for field use. **Interstate Sales Co.,** 1123 Broadway, New York City.



"Wolfe" angle meter. It gives direct reading for any angle of bend up to 126 deg on pipe diameters from 1 to 20 in.

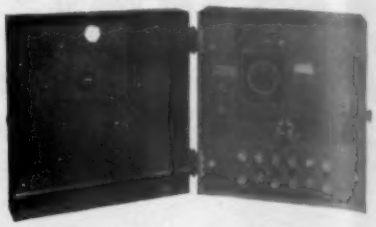
» «

Protective Cream

★ **"Cadet Waterproof Creme"** is said to provide protection to mucous membranes (nasal septum and lips) against the irritant fumes of fluorides and hydrofluoric acid encountered in welding aluminum alloys and stainless steel—also protection against zinc chloride and hydrochloric acid fumes encountered in soldering operations. The cream should be used twice daily on the exposed skin areas and rubbed in well. It is used on the nostrils and lips. **Cadet Creme Co.,** 151 Farrar Ave., Worcester, Mass.

Current Compensator

★ A compensator providing automatic regulation of resistance welding current is announced by the electronic control section of the **General Electric Co.,** Schenectady 5, N. Y. This device consists of an electronic control circuit which automatically retards or advances the firing point of the ignitron tubes, thus compensating for changes in line voltage or welding conditions. The compensator can be applied to most G-E resistance welding controls which incorporate the phase-shift method of heat control.



G-E electronic current regulator. It automatically adjusts the firing point of the ignitron tubes in the welding control circuit.

By holding constant the root mean square (or true heating value) of the weld current for any setting, the compensator facilitates the production of consistent spot welds. It is said to hold the welding current to a variation of plus or minus 2% under conditions which would cause the unregulated welding current to vary by as much as plus or minus 20%.

» «

Fluxed Wire Solder

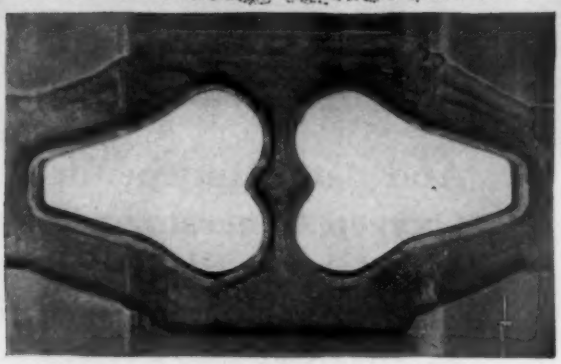
★ **"Fluxrite"** is a new fluxed wire solder featured by the fact that the flux is contained in longitudinal grooves on the surface of the rod rather than in the conventional core. Since the flux is outside, it liquefies and flows onto the work before the solder melts, insuring thorough fluxing and a stronger and better solder joint, states manufacturer. Fluxrite comes in the same diameters as cored solder and with two types of flux, which have been dyed red and green to permit quick identification by the stripes. **National Lead Co.,** 111 Broadway, New York City.

» «

Light Duty Toggle Clamps

★ A recent addition to the **"De-Sta-Co"** line is a small, light duty toggle clamp with a T-shaped handle. The latter is said to provide a firm grip in spots where limitation of overhead space would prohibit the use of larger or taller clamps. The new model is available with a straight work bar or with a U-bar in which the retaining bolt can be set at any desired distance from the handle. Dimensions are 3⅞ in. from end of work bar to end of base and 4 in. high when in locked position. **Detroit Stamping Co.,** 372 Midland Ave., Detroit 3.

THIS DIE WILL LIVE!



Hard-Facing with Wear-Resistant Coast Metals

Enables it to "Consistently Trim 100,000 Forgings..."

Time after Time

There, in a word, you have the story of this trimming die for forming tank tread end connectors.

Made of ordinary carbon steel, 3" thick, it is constructed with a 3/16" x 3/16" ledge, cut into the top edge of the trimmer. This cut-out is protected with a wear-resistant Coast Metals Hard-Facing, and then the overlay is ground to the correct size and shape. When the die needs reworking, another Coast Metals overlay, requiring only 4 or 5 ounces of weld rod, makes it good as new, ready for another life of genuine service.

Coast Metals can be welded either by the electric arc or the acetylene torch to all ferrous metals, including manganese steel, alloy steel, cast iron and chilled iron. New booklet, "Your Best Protection Against Wear" contains full details. Write for your copy today.

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COAST METALS
hard-facing
weld rods
MAKE YOUR EQUIPMENT LAST LONGER

RACOLLOY

Stainless Electrodes

PROVE THEIR WORTH ON THE TOUGHEST JOBS

RACOLLOY 19-9

For the all-position welding of certain high-tensile, low-alloy, air-hardening steels, use Racolloy 19-9 Stainless Electrodes. The superiority of Racolloy 19-9, as of all Raco products, is assured by the most minute laboratory control throughout the entire production cycle.

RACOLLOY 19-9 Electrodes conform with Ordnance Specification AXS-886... U. S. Navy Bureau of Ships Specification 46E4 (INT)—Grade V, Classes 1, 2 and 3

RACOLLOY 25-20

For the all-position welding of austenitic, corrosion and heat-resisting steels, use Racolloy 25-20 Scale-Resisting Shielded-Arc Electrodes. While specially designed for such work, they may be successfully used on high-tensile, low-alloy, air-hardening steels.

RACOLLOY 25-20 Electrodes conform with U. S. Navy Bureau of Ships Specification 46E4 (INT)—Grade IV, Classes 1, 2 and 3.

The REID-AVERY COMPANY

DUNDALK BALTIMORE 22 MARYLAND

Silver Solder Substitutes

★ **Eutectic Welding Alloys Co.,** 40 Worth St., New York City 13, has developed several alloys said to offer the advantages of silver solders with little or no silver—a substance which has increased in price since last August when it became mandatory for manufacturers to use domestic silver instead of the cheaper foreign product.

» «

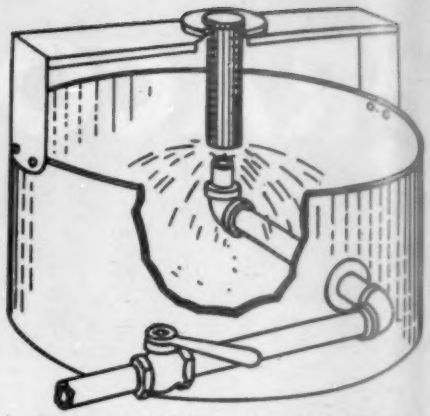
Spot Weld Tester

★ The **S-A Tensile Tester,** a machine made primarily to check the strength of veneers and thin plywoods, will do as complete and accurate a job on spot welded sheet metals, according to engineers of the **Streeter-Amet Co.,** 4140 North Ravenswood Ave., Chicago 13. Tensile tests of spot welds are simply made. The sheet metal is merely dropped in the tester and held by clamping action while hydraulic pressure is applied. The breaking load in pounds pull is read directly on the dial, without computation.

» «

Fixture for Jominy Tests

★ This new fixture, with its accessory tongs, was designed to facilitate Jominy End Quench Hardenability Tests—made standard by the American Iron and Steel Institute as the best and quickest method of determining the response of NE steels to heat treatment. A considerable saving in the time of testing is said to be effected. **Claud S. Gordon Co.,** 3000 South Wallace St., Chicago 16.



Cutaway view of fixture for making Jominy hardenability tests on NE steels. A test specimen is shown hanging in the fixture.

» «

All-Plastic Safety Goggles

★ **"Eye Savers"** are lightweight all-plastic goggles for general industrial uses. The one-piece lens is of non-fogging, shatterproof methacrylate; it will withstand heavy impact and is also highly resistant to pitting from sparks, manufacturer claims. The curved plastic frame fits the face snugly, shielding the eyes from every angle. The brass clip at the bridge is the only metal piece. **Watchemoket Optical Co., Inc.,** Providence 3, R. I.

Model 7 "Eye Savers." Other styles of these all-plastic goggles are available for wear over prescription glasses.

» «

Soldering Flux

★ This new **Mogul** soft soldering flux has a lower melting temperature than soft silver solder on initial heats and once activated will work on temperatures slightly higher than 60/40 solder. It may be used for tinning cast iron, steel, copper, brass, aluminum, etc. **Metallizing Company of America,** 1330 West Congress St., Chicago 7.

New Saw-Gun Saws and Files in Hard-to-Get-At Places

Jobs of sawing and cutting that are inaccessible to ordinary tools, are now made possible with the recently developed Saw-Gun. It works equally well on wood, plastics, light and heavy gauge metals (corrugated or plain—stainless and monel), castings, rods and other materials. The Saw-Gun saves hours on panel notching and slotting operations, doing work ordinarily requiring the use of several tools.

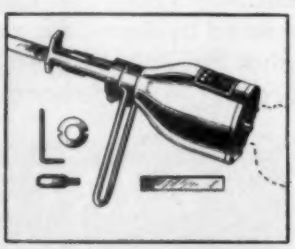
It is propelled by electric power, compressed air or flexible shaft and provides an efficient portable power-saw or file, that can be carried from place to place.

The Saw-Gun is operated by placing cutting edge of saw blade against work and turning on power. Filing is accomplished in the same manner by inserting a file in the tool instead of a saw blade.

We hope this has proved interesting and useful to you, just as Wrigley's Spearmint Gum is proving useful to millions of people (much to their surprise) working everywhere for Victory.

You can get complete information from the Mid-States Equipment Company, 2429 S. Michigan Ave., Chicago 16, Ill.

Permits sawing and filing in spots inaccessible to ordinary tools.



Can be directly connected to electric drill, air drill, or flexible shaft.

Y-105

Imagine!

MAINTENANCE COST ON A ROD SAVER

(ELECTRODE HOLDER)

ONLY 65c PER 100 DAYS

Under hard use over a long period of time maintenance costs on Rod Saver "Suregrip" electrode holders average but 65 cents for 100 days. It's the new, exclusive, reenforced insulator caps that do the trick. Fully insulated. Handle stays cool. Insulating material and handle will not swell with moisture nor shrink from heat.

Burns electrodes to a 1" or 1¼" stub without overheating holder. Cuts rod costs 7 to 14%.

Replacements are at a minimum with Rod Savers.

Contact your distributor—OR

Martin Wells

5886 Compton Avenue — Manufacturer — Los Angeles 1, Calif.

CUTS ROD COSTS 7 TO 14%

News of the Industry

Jap Torpedo Couldn't Sink This Welded Liberty Ship

With the sea flowing into her two after holds through huge holes on either side, the Liberty ship *William Williams* survived a torpedo attack by a Jap submarine and made an Australian port. Her stern was under water, her engines were running at half speed and her steering gear was knocked out; nevertheless, under escort of a Naval vessel, she struggled 83 hours to reach safety.

In making public the story of the *William Williams*, Admiral Emory S. Land, chairman of the U. S. Maritime Commission, stressed the ability of welding to stand up under the most exacting circumstances that sea warfare can bring.

Ample evidence of the skill of the men and women weldors who helped build the *William Williams* at the Richmond, Calif., shipyards was provided by the manner in which the welding withstood the terrific pressure of the explosion. While some welds were broken by direct hits from flying fragments, in no case did they split. Steel plates split away from the welding but not along it. One weld was broken three times within four feet, but there was no split and the plates held together. Even where rivets in positions near the explosion shot out, the welding held.

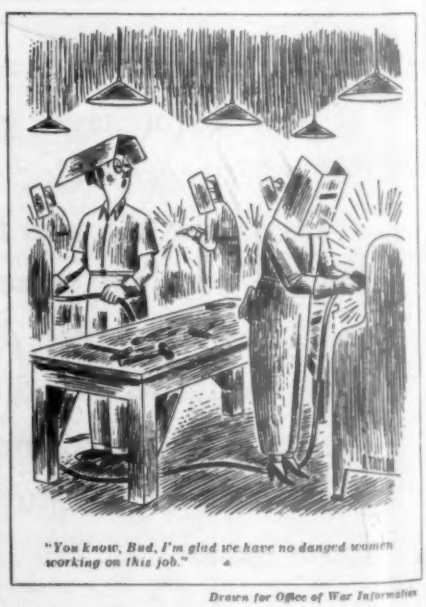
» «

Vera Anderson Keeps Her Welding Crown

Still champion woman weldor of the world, 20-year-old Vera Anderson of Pascagoula, Miss., was recently called upon to defend her title against the Pacific Coast champion, Mrs. Edna Slocum. The two contestants tied in the test plates run for quality, but Miss Anderson gained the deciding advantage in speed, welding overhead, horizontal and vertical fillets. Her final point score was 364.95 against the challenger's 338.50.

The winner and champion, Miss Anderson, is now a welding instructor for Ingalls Shipbuilding Corp. She entered war work after having been a waitress and a shoe clerk. Mrs. Slocum, who is employed by the Moore Dry Dock Co., Oakland, Calif., is a ranch wife and the mother of two children. She had proved her ability over 10,000 other women weldors in California and the Pacific northwest.

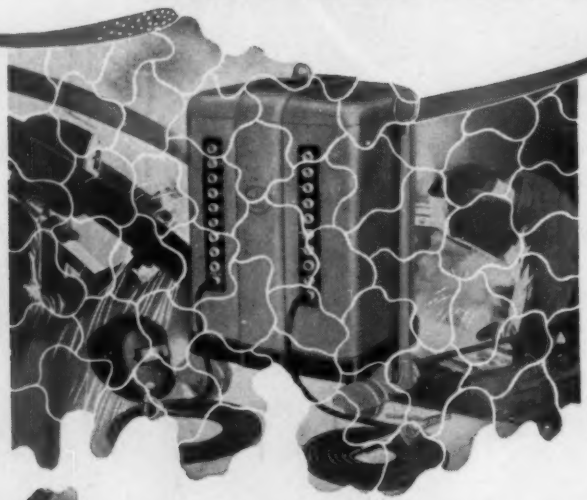
» «

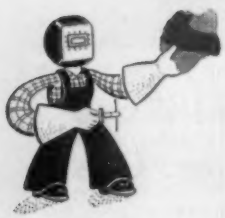


"You know, Bud, I'm glad we have no dazed women working on this job."

Drawn for Office of War Information

MARQUETTE
REGISTERED U.S. PAT. OFFICE
A.C. ARC WELDERS
fit into any
WELDING PICTURE





. . . because they have "what it takes" to deliver ***the speed, the economy, the performance*** that is the solution of every welding problem.

TEN OUTSTANDING MODELS, 125 to 400 amps. for light work on sheet metal or heavy-duty production.

NO "MAGNETIC BLOW". Perfect welds in deep grooves and angles. All positions. Greater speed with bigger rods and higher current.

LOW INITIAL COST. 50% under comparable motor-driven equipment. All accessories included.

LOW OPERATING COST. High power factor, low idling cost. No moving parts to wear out. Negligible upkeep. Instantaneous heat selection. All asbestos insulation.

Send for free, 24 page, illustrated booklet.

MARQUETTE MFG. CO., INC.
Minneapolis 14, Minn.

MARQUETTE
a.c. arc welders

ONLY 7½ OUNCES of streamlined, fully-insulated holder, this mighty mite packs a production punch. TWECO "HOL-GRIP JR." is tops for light, high-speed production welding. Especially designed for the aircraft industry, its light weight, compactness (actual size shown above), and ease of operation make it ideal for women weldors.

SPECIFICATIONS — Capacity — 150 Amperes. Electrode size — 1/32" through 5/32". Weight — only 7½ ounces. Length — 7". Handle — 1" in diameter, fully insulated and aerated. Holds electrodes in positive 45° and 90° positions. All parts are replaceable. Price "HOL-GRIP JR." Holder only $3.75. In dozen lots, $3.40.

Write for Bulletin No. 1943-GW showing complete line of TWECO PRODUCTS including other models of TWECO Holders, Ground Clamps, Cable Lugs, and Cable Connectors.

TWECO PRODUCTS COMPANY

English at Ida — MANUFACTURERS — Wichita 7, Kansas, U.S.A.

Distributed in Canada by G. D. PETERS & CO. OF CANADA, Ltd. — 1021 Birks Bldg., Montreal

DISTRIBUTORS ALL OVER THE UNITED STATES

O.K. ASTM Standards for Firebox and Boiler Plate

The American Standards Association has recently approved as American Standards three specifications formulated by the American Society for Testing Materials on various grades of steel plate. These are:

"Low Tensile Strength Carbon-Steel Plates of Flange and Firebox Qualities" (G30.1-1943, ASTM A89-43). This covers two grades of carbon-steel plate. The material is suitable for fusion welding and, if certain requirements are met, for forge welding.

"Carbon-Silicon Steel Plates of Ordinary Tensile Ranges for Fusion-Welded Boilers and Other Pressure Vessels" (G31.1-1943, ASTM A201-43). This covers carbon-silicon-steel plates intended particularly for fusion welding and for use in locomotive boiler shells, boilers for stationary service and other pressure vessels. There are two tensile strength ranges designated as grades A and B.

"Low Tensile Strength Carbon-Steel Plates of Structural Quality for Welding" (G40.1-1943, ASTM A78-43). This covers two grades of carbon-steel plates of a structural quality suitable for welding (and for forge welding if certain specified requirements are met).

These standards may be obtained for 25 cents each from the American Standards Association, 29 West 39th St., New York City 18.

U. S. PRESSURE GAUGES

FOR HIGH AND LOW PRESSURE OXY-ACETYLENE APPARATUS

are helping thousands of contractors for the Army and Navy to save gas by enabling the operator to use the correct pressure for every job.

U. S. GAUGE CO.

14 WALL STREET NEW YORK 5, N. Y.

Train Women Welders for New LSM Craft

Keel of the first ship in a "revenge fleet" of all-welded landing craft was laid last month by the Pullman-Standard Car Mfg. Co. Officially designated as "LSM" by the Navy, the new ships are designed to carry men, tanks and guns through the surf to enemy beaches. The company has contracted to deliver at least one such ship per week, completely equipped, tested and ready for action.

These ships will not have a single rivet on them but will be assembled from start to finish entirely by welding. For this purpose, 500 women have been trained at the company's welding training schools, in which an average of nearly 500 students per month have been qualified during the past eighteen months.

The assembly-line method of production is used for the production of the new LSM ships. Small parts and assemblies are cut and fitted in the car shops, and the pieces are then moved to the company's new assembly plant in Chicago's South Side. In this quarter-of-a-mile-long plant, cranes 75 feet in the air lift the component parts and set them down in the steel jigs in which they are welded into the various ship sections.

» «

Service for USL Welders

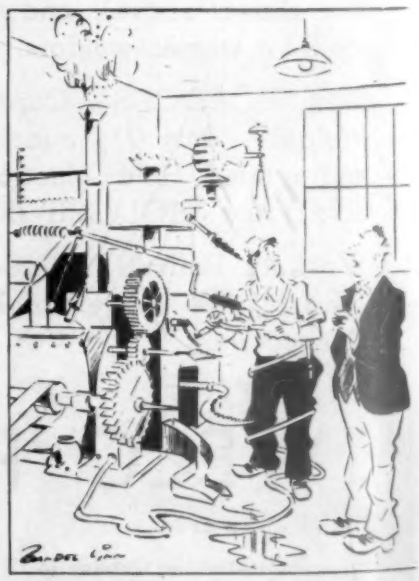
US Electric Welder Corp., Toledo 6, O., announces that it is in a position to supply most of the replacement parts that may be needed for USL d-c welders—a line discontinued about five years ago.

» «

Distributor Appointed

George R. Mowat Co., New York City 18, manufacturer of Griffin's "Hytemp" protective coating, has appointed the Thompson-Hayward Chemical Co., Kansas City, Mo., as a distributor.

» «



"Let me know if anyone gets killed at this machine, and I'll install safety appliances!"

THE FLAME OR THE ARC?

. . . WITH EITHER YOU NEED THIS COMPLETE NEW CATALOG OF WELDING ACCESSORIES

Select the correct accessories, the ones that fit your exact job requirements, from this new catalog. It illustrates, describes and prices scores of welding and cutting accessories, with many styles and sizes in practically every item. For example —there are 31 models of electrode holders . . . 9 types of helmets and handshields . . . complete selection of protective clothing . . . 10 styles of goggles and spectacles . . . fluxes for all types of welding and brazing . . . and numerous other accessories that aid in getting greater production.

WRITE FOR YOUR FREE COPY TODAY!

NATIONAL CYLINDER GAS COMPANY

Industrial Gases

205 WEST WACKER DRIVE CHICAGO 7, ILLINOIS

Branches in All Principal Cities

OXY-ACETYLENE APPARATUS AND SUPPLIES, ARC WELDING EQUIPMENT, ELECTRODES

New Film for War Workers Shows Battle for Beaches

Gallant, well trained fighting men of the Army, Navy and Marines, as well as thousands of landing craft and their component parts, play their real-life rôles in "Battle for the Beaches," a swift-moving film preview of the all-out invasions that are fast paving the way to Berlin and Tokio. This film, recently released for showings to war workers by the Industrial Incentive Division of the U. S. Navy, re-enacts such amphibious operations as Bougainville, Lae, Guadalcanal, Salerno, and bloody Tarawa. Also included is a captured German film depicting the Nazi version of the Dieppe "dress rehearsal."

War plants desiring to exhibit "Battle for the Beaches" should write for information to the Industrial Incentive Division, Navy Department, 2118 Massachusetts Ave., N.W., Washington, D. C. A nominal rental charge is made.

» «

900 Less Locomotives Now Needed for War Transport

Altered military requirements will reduce by 741 the number of steam locomotives of 80 tons or more and by 162 the number weighing from 50 to 80 tons, from the scheduled quotas for 1944. The reduced requirements will not release any production facilities, however, since the original program had called for progressively increased output in each quarter of 1944. Even under the reduced program, more than 2,000 large and 300 small steam locomotives will still have to be supplied for military purposes this year.

» «

Picture Charts Speed War Work

Willard Lund, former correspondence school crafts instructor and illustrator, became employed by the Westinghouse Lamp Division and was soon up to his ears in the drawing of pictorial procedure charts. He found that the same technique used by mail-order schools to teach such crafts as jewelry making, leather work and basketry can also be used to good advantage to shorten the time spent in training new workers.

With the aid of Mr. Lund's procedure charts, two shifts of two operators can be taught a new electronic brazing operation in a single day. Such brazing was formerly done by a slower method that required three days to train one operator. By eliminating the necessity for repeated instruction, the charts permit a foreman or group leader to devote the major part of his time to inspecting and expediting.

» «

Provo, Utah, Plant Starts Making Steel

Production of steel started last month at the Defense Plant Corporation's new $180,000,000 plant near Provo, Utah. This plant, the largest in the West, is operated for the Government by Geneva Steel Co., a U. S. Steel subsidiary. It will have a yearly capacity of approximately 1,280,000 tons.

» «

2,400 Ex-Service Men Go Back to Work at G-E

Honorably discharged from active duty, 2,400 General Electric employees who entered the armed services since Pearl Harbor have been re-placed with the company's working forces. However, there are still 39,236 ex-employees of General Electric in service, and 156 more have lost their lives or are reported missing in action.

General Electric has today some 192,000 employees as compared with a normal 65,000 in peace times.

» «

Moves to New Quarters

Metro Manufacturing Co. has moved from Jamaica, N. Y., to much larger quarters at 38-11 Thirty-first St., Long Island City, N. Y., occupying the entire building, which was recently purchased by this company. Two floors and a basement provide more than 6,000 square feet of floor space to be devoted to the manufacture of Metro welding equipment and safety items. A department will also be maintained for the repair of all makes of oxy-acetylene equipment.

● Put SKILSAW DISC SANDERS to work on your toughest grinding and sanding jobs . . . and you'll cut minutes off every surfacing operation . . . save money and manpower. They're lighter, faster, more compact; more powerful, insuring higher load speed!

SKILSAW DISC SANDERS do all finishing on flat or curved surfaces of all materials . . . *faster!* They grind down welding beads, remove fins and scale from castings, clean metals, sand, file, buff and polish. Ask your distributor to demonstrate SKILSAW DISC SANDERS on your surfacing jobs today!

SKILSAW, INC., 4763 Winnemac Ave., Chicago 30, Ill.
Sales and Service Branches in All Principal Cities

SKILSAW PORTABLE ELECTRIC TOOLS
MAKE AMERICA'S HANDS MORE PRODUCTIVE

SKILSAW Quality SANDING DISCS

Whatever your metal finishing jobs may be . . . you'll finish faster and better if you use the *genuine* SKILSAW Quality Sanding Discs. They are made of sharp-cutting aluminum oxide bonded with heat-resisting resin to a flexible fibre back. Available in 7 in. and 9 in. sizes, in all popular grades. Your distributor has them in stock for immediate delivery.

Here's *another job* where welding saves valuable time and material . . . with

Ampco Metal, Inc.
MILWAUKEE WISCONSIN

ENGINEERING DATA

Arc-Welding Without Preheat to Repair Brass and Bronze Castings

{Number 107}

AMPCO-TRODE 10

You can salvage defective brass or bronze castings . . . by arc-welding without high preheat . . .

Here is a practical, tested method for avoiding the delay and loss which results when a defect shows up in a brass or bronze casting — after remaining undiscovered, many times, right up to the stage of finish-machining.

With Ampco-Trode 10, you can reclaim your casting. Without the risk of high preheat, you get a repair comparable with the base metal in strength ductility, and hardness — and closely matching it in color. Small pieces and light sections require little preheat — the heaviest jobs not over 500°.

Free data sheet gives complete instructions.

Write for it today. W-73

Reg. U. S. Pat. Off

AMPCO

Ampco-Trode is a product of

Ampco Metal Inc.

5 grades of Ampco-Trode coated aluminum bronze welding electrodes . . . .

for metallic-arc, carbon-arc, or gas welding

Ampco-Trode 10
Gray Coating — Blue Tip
General-purpose bronze welding rod for welding dissimilar metals, manganese bronze castings, brass sheets and plates, etc.

Ampco-Trode 16
Gray Coating — Red Tip

Ampco-Trode 18
Gray Coating — Black Tip
For high-tensile welds requiring good ductility and subject to severe conditions of wear or corrosion.

Ampco-Trode 20
Gray Coating — Green Tip

Ampco-Trode 21
Gray Coating — White Tip
For bearing conditions of unusual wear under bearing pressures.

Consult your electrode supplier. Data sheet sent free. Tear out and mail the coupon.

AMPCO METAL, INC., Dept. WE-6, Milwaukee 4, Wis.
Please send Engineering Data Sheet No. 107 — also Ampco-Trode 10 Bulletin.

Name..... Position.....
Company.....
Address.....
City..... (.....) State.....

WJ-3,

Ryerson Buys Bethlehem Warehouse at Pittsburgh

The Pittsburgh steel warehouse plant of the Bethlehem Steel Co. was recently purchased by Joseph T. Ryerson & Son, Inc. This property consists of a large modern warehouse building containing 150,000 sq ft on an industrial site of several acres. It is located in Carnegie, Pa., in close proximity to the Pittsburgh area.

» «

Film Ready on Tool & Die Welding Problems

Two sound slide films depicting the use of tool-steel welding electrodes have been released for showings by the Welding Equipment and Supply Co., 223 Leib St., Detroit 7. One of these shows how such electrodes have been developed for use on each classification of tool steel, while the second film deals entirely with their proper application in the metal-arc welding of tools and dies.

» «

Progressive Welder Opens Los Angeles Branch Office

A new factory branch office has been opened by the Progressive Welder Co., Detroit, at 1007 Broxton Ave., Los Angeles 24. Howard Dally and A. N. Seedorf are the local field engineers in charge.

A VITAL UNIT...

of the Portable Welder!

HOW TO MAKE YOUR GOVERNORS LAST!

Like others manufacturing for war needs, Pierce production is for war and essential industry. For this reason new governors can be supplied only on a priority basis. But Pierce calls attention to these easy measures which will make your present Pierce Governors last and give the best service.

- **CLEAN GOVERNORS** once a month with kerosene, gasoline, or prepared cleaner.
- **INSPECT AND CHECK GOVERNORS** each week when in continuous operation.
- **CHECK OIL LEVEL** every day in manually lubricated governors. Use the same grade oil as recommended for the engine.
- **LINE UP** driving pulleys or gears accurately when reassembling governor after cleaning.

Should your governor need repair or reconditioning send it to the factory with the necessary preference rating certificate.

● Pierce Flyball Governor's time-proven flyball design provides simple, mechanical operation that is positive and unfailing . . . giving close, sensitive regulation necessary for perfect welds.

Their action is positive . . . mechanically efficient . . . and assures *complete* recovery of current characteristics within 3/10 second after striking arc.

To be sure of the weld . . . be sure the governor is Pierce. Their rugged precision construction will give you the maximum of service life and satisfaction. Specify Pierce Flyball Governors to regulate your welding operations!

THE PIERCE GOVERNOR COMPANY, INC.
1607 OHIO AVENUE • ANDERSON, INDIANA

Manufacturers of Pierce Precision Governors and Sisson Automatic Chokes

Pierce Governors
STANDARD SINCE 1913

ABOUT PEOPLE

For the first time in the history of the Colonial Tanning Co., Inc., Boston, a woman has been appointed to an executive position. She is **Miss Mary Cherbuy,** who joined the organization as a stenographer and has now been promoted to assistant personnel manager, under the direction of Personnel Manager John Mercon.

» «

R. H. Davies has been appointed welding engineering representative in Washington, D. C., for The Lincoln Electric Co. He will be located at 410 Hill Building. Mr. Davies has been previously associated with the Lockheed Aircraft Corp., with Northrop Aircraft, Inc., and with Henry J. Kaiser's magnesium plant at Permanente, Calif.

» «

Thomas P. Gorter was recently elected a vice-president of the Pullman-Standard Car Mfg. Co. He has been in charge of the Washington, D. C., car sales office since 1928 and an assistant vice-president for the last two years.

» «

Fred C. Smith, formerly assistant sales manager, has been promoted to general sales manager of the McKay Company, Pittsburgh and York, Pa. He has been with the company since 1927, starting as statistician and sales correspondent.

» «

Dr. Ora Stanley Duffendack, professor of physics at the University of Mich., has been appointed director of research of North American Philips Co., Inc., manufacturer of electronic products including cathode-ray tubes and X-ray equipment. He will establish scientific laboratories for this company in Westchester county.

» «

L. P. McAllister, who has been metallurgical engineer for Lukens Steel Co., since 1936, has been appointed assistant to the general superintendent with specific duties of quality control. **Joseph G. Althouse** succeeds Mr. McAllister as metallurgical engineer, and **William Taylor** has been appointed engineer of tests, succeeding Mr. Althouse.

» «

Aluminum Company of America has announced the appointment of two industry managers in the railroad and automotive fields. These are: **John O. Chesley,** who has been named railway sales manager, and **Frank C. Barrows, Jr.,** who has been appointed automotive sales manager. Mr. Chesley had been head of the company's sales development division and Mr. Barrows district sales manager in Detroit.

Central Steel & Wire Company

OFFICES AND PLANTS

CHICAGO 80, ILL. 3000 W. 51 st. St. • REPUBLIC 3000

DETROIT 11, MICH. 5035 Bellevue Ave. • PLAZA 6780

CINCINNATI 16, OHIO 525 Township Ave. • AVON 2230

DAYTON 1, OHIO 1095 E. Monument Ave. • FULTON 8181

TELETYPE NUMBERS:- CHGO 1269 · · · DET 33 · · · CIN 64 · · · DAY 146

Saved...

up to 160 MAN-HOURS per Welder Unit*...

. . . with BADGER D-C Generator Welder FILTER

IN ONE LARGE WAR PLANT (name on request) process and atmospheric dusts drawn into Generator Welders caused an average of FOUR "down-times"* per year for repair and overhauling—lost up to 160 MAN-HOURS per unit!

BADGER D-C Generator Welder PERMANENT FILTERS were installed. Since then, over four years ago, not ONE Welding Unit has been out of operation for repair caused by process and atmospheric dusts. Savings in Man-Hours, Money and Lost Production time more than paid the cost of each BADGER PERMANENT FILTER during the first year.

You, too, may enjoy similar benefits on YOUR Generator Welding Units! The BADGER Permanent-type Filter is easy to install—and inexpensive. Write for information TODAY! Send us the complete information to identify the make, style and model of Welder used.

* "Frozen" or clogged rotors—Excessive wearing of generator and Exciter Brushes, based on an average of 7488 machine hours per year.

Badger MANUFACTURING & SALES COMPANY

335 EAST BROWN STREET
MILWAUKEE 12, WISCONSIN

Manufacturers of PERMANENT Filters for Heating, Ventilating, Air Conditioning Aircraft and Industrial use

INTRODUCTORY $10.00 PACKAGE

CONTENTS

MANGANAL
SPECIAL TITE-KOTE
WELDING ELECTRODES
5 lbs. ¼"x18"
10 lbs. 3/16"x18"
5 lbs. 5/32"x18"
SEACO
HARD FACING ELECTRODES
5 lbs. 3/16"x12"
For
A.C. and D.C.

For Reclamation Welding of 11 to 14% Manganese Steel Jaw, Gyratory and Roll Crushers, Shovel and Dipper Teeth, Buckets, Gears, Pinions, Sprockets, Tractor Treads, Rollers and Grousers, R. R. Frogs and Crossings, Pump Shells and Impellors.

☐ Have Your Nearest Distributor Ship Us (1) Only $10.00 Introductory Package.

☐ Mail Us Direct One FREE Copy of Your New Booklet "The Welding of 11 to 14% Manganese Steels."

Name .....
Street .....
City .....
Signed .....

$13.67 Worth for $10.00

Only One Box To A Customer

Our Distributors
Can Make Immediate
Shipment From Their Stock

Sole Producers

STULZ-SICKLES CO. NEWARK 5, N. J.

R. L. Anderson has been appointed chief engineer in charge of work on Army and Navy equipment for the Franklin Transformer Co., Minneapolis. He has been with this company since 1942.

» «

Lee W. Ralston has been named supervisor of industrial relations for the manufacturing and repair department of Westinghouse Electric and Mfg. Co. He was formerly supervisor of trade and industrial teacher training for the California State Department of Education.

» «

William I. Burt has been appointed general manager of plants and **Dr. Frank K. Schoenfeld** director of technical development for the recently created chemical division of The B. F. Goodrich Company. This division operates the Government-owned synthetic rubber plants at Louisville, Ky., Borger and Port Neches, Tex., as well as raw materials plants at Louisville, Niagara Falls and Akron.

» «

Harry H. Lumley has been named Chicago district manager for the American Steel & Wire Co. to succeed **Fred Ingraham,** who is retiring after an association of more than 50 years with this company.

» «

A. D. Robertson has been appointed assistant manager of the motor division of Allis-Chalmers Mfg. Co., at the Norwood works, Norwood, O. He was formerly in charge of the marine section in the company's electrical department in Milwaukee.

» «

Dr. Joseph C. Donchess has been appointed chief surgeon of the two Gary plants of the Carnegie-Illinois Steel Corp. He joined the Gary Works medical staff in January, 1937, as assistant surgeon.

» «

James H. Jewell has been appointed assistant manager of the industry departments of Westinghouse Electric and Mfg. Co. He will continue as manager of the company's agency and specialties department, a position he has held since 1940.

» «

Paul D. Mallay has joined the staff of Lukens Steel Co. as manager of the railroad division. He was formerly railroad representative in the southeastern territory for the Garlock Packing Co.

Died . . .

Lawrence H. Dunham, assistant manager of the metallurgical department of the American Steel & Wire Co., died suddenly in Pittsburgh on January 19. He was 52 years old and had been with the company since 1916.

TRY THIS NEW FLUX....WELDALENE

MANUFACTURERS of coated welding rod are invited to investigate the possibilities of a new addition to Foote's comprehensive list of welding fluxes—known as Weldalene.

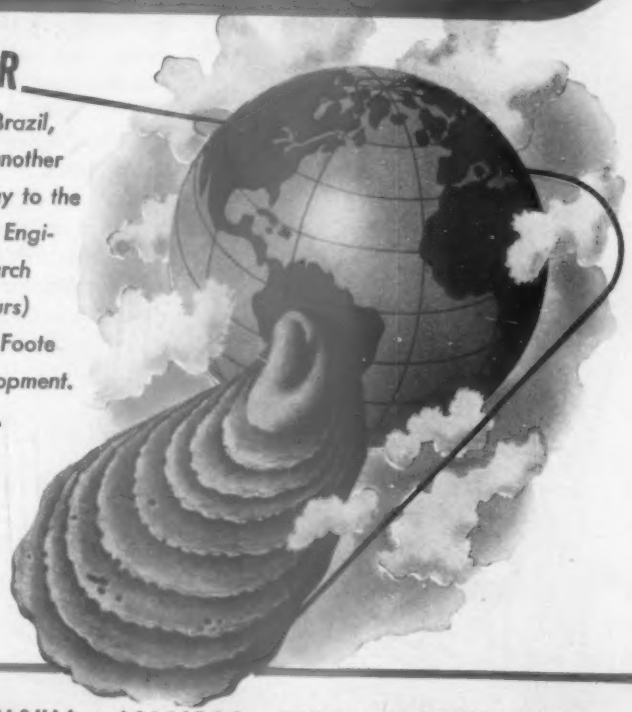
Weldalene is not "just another" flux. It fills, we believe, a long standing gap in fluxing materials. Among its properties, suggesting use in mild steel and stainless rods (A. C. or D. C.) are:

1. Unusual sintering characteristics. Weldalene begins to sinter at about 1920°F. But it does not deform below approximately 2140°F. Consequently, it is an active flux over a wide range of temperature, which suggests a means of controlling slag fluidity.
2. Weldalene is "silica hungry." Its ratio of alumina to silica is 24% to 60%, indicating that Weldalene—by reacting with free silica—may reduce silica included in weld metal.
3. Weldalene contains a substantial percentage of potassium, assuring greater arc stabilization.

From recent studies and commercial applications in ceramics, it can be reported that Weldalene is an excellent vitrifying agent contributing to the glassy phase which combines other ingredients together more strongly. This property suggests that Weldalene might be used advantageously to increase the dry strength of coatings, eliminating to a degree unnecessary wastage of partly consumed electrodes. You are urged to write at once for a sample of Weldalene, analysis and prices. An inquiry will receive a prompt reply.

THE WORLD IS OUR OYSTER

Manganese from Cuba, Ilmenite from India, Rutile from Brazil, Celestite from Mexico . . . ores and minerals from many another Good Neighbor, from our Allies and from home find their way to the Foote Mineral Company on the heels of globe-trotting Foote Engineers. • Foote sees these products of the earth through research and processing, huddles with many industries (including yours) in their development. In addition to present definite uses of Foote products, there are probably many others now awaiting development. We urge you to let us work with you in your own research.



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A Step Ahead in Industrial Ores and Chemicals

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Home Office: 1612 SUMMER STREET, PHILADELPHIA, PA.
West Coast Repr.: Griffin Chemical Co., San Francisco, Calif. • English Repr.: Ernest B. Westman, Ltd., London, Eng.

Helpful Literature Just Published

The following reviews are of recent publications of interest to those in the welding industry. Unless otherwise stated, they may be obtained without cost by writing to the manufacturers listed.

Electrode Comparison Chart

A new Electrode Comparison Chart is printed in two colors on durable cardboard stock, letterhead-size. It gives at a glance the scope of application of each member of the "Perfection" line of welding electrodes and shows the classification of each electrode under AWS-ASTM Specification A-233, as well as corresponding designations for other makes of electrodes. The data includes several new electrodes which were only recently added to the "Perfection" line. **The Anthony Carlin Co.**, 2717 E. 75th St., Cleveland 4.

» «

Amsco Booklet

"Manganese Steel for Cement Mill Equipment" is the title of a 32-page, letterhead-size booklet depicting the uses of "the toughest steel known" in cement quarries. Among the products covered are welding rods for reclamation and hard-facing. **American Manganese Steel Division of American Brake Shoe Co.**, Chicago Heights, Ill.

» «

Aluminum Cleaning Booklet

A booklet giving complete information on the "Clepo Tetra-Dip" process for aluminum treatment prior to spot welding is available from **Frederick Gumm Chemical Co., Inc.**, 538-42 Forest St., Kearny, N. J.

» «

Spatter Preventive Folder

A two-color folder describing the advantages of "Protect-O-Metal No. 2" has been issued by **G. W. Smith & Sons**, Dayton, O. This product is brushed or sprayed into the seam to be welded and on surrounding surfaces. Besides protecting work surfaces, it is said to have fluxing qualities.

» «

Flux Reference Chart

A "Rapid Reference Chart," 12½ by 19 in., gives the uses, features, applications and container sizes of 17 Amco welding and soldering compounds and fluxes. **American Solder & Flux Co.**, 2152-54 East Norris St., Philadelphia 25.

» «

Safety Clothing Catalog

Weldors' coats, pants, overalls, chaps, bibs, aprons, sleeves, spats, gloves, capes and curtains are illustrated and described in the new 12-page, 6 by 9 in., "Saf-T Garment" catalog of **Fred Jessar**, 404 Denckla Bldg., Philadelphia 7.

» «

Welding Crane Bulletin

A two-page, letterhead-size leaflet, Unit 68, has been issued to describe the new Whiting automatic welding cranes —a product designed to facilitate the operation of submerged melt automatic welding equipment. **Whiting Corp.**, Harvey, Ill.

» «

Electronic Tube Chart

A quick-selection chart of electronic tubes for industry is contained in a new four-page bulletin, ET-12, just published by **General Electric Co.**, Schenectady 5, N. Y. This contains a comprehensive listing of various phanotrons, thyratrons, ignitrons, glow tubes, kenotrons and other types of tubes.

» «

Protective Coating Data

A folder to describe the action of Griffin's "Hytemp" protective coating has been issued by the **George R. Mowatt Co.**, 24 West 40th St., New York City 18.

Here's what makes
BRIDGEPORT BRONZE WELDING RODS
"Equal to any Job...worthy of your skill"
Low melting point—easy flow—good tinning action—smooth, easy machinability—these are some of the features of Bridgeport Bronze Welding Rods. Put it down to the uniformity of these rods...to reliable, workable qualities...to the metallurgical research and development of 78 years experience. It all adds up to strong, dense, tough welds that meet the maintenance and repair requirements for large or small parts. For salvaging broken machinery, the country owes much to the welder for speeding the war effort. To get the best in welding rods—specify "Bridgeport."
Bronze WELDING ALLOYS
FACTS for WELDERS ...Practical, up-to-the-minute data. How to select and use bronze welding rods for best results. It is yours free by writing Bridgeport.
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ESTABLISHED 1865

A GOOD WELD Begins with a GOOD ROD

Tested on a broad scale for the first time, by the strenuous demands of all-out war production, welding has "grown up". It now meets every imaginable need from work on light sheet to the welding of an entire ship. And out of all this emerges the very valuable fact that *only a good rod does a good job!*

Back of Seymour Phosphor Bronze Welding Rods is a long experience in manufacturing Phosphor Bronze for fabrication. They are specially alloyed to produce welds of high tensile strength—and proof that they do this is their large-scale use in the principal war plants of the country.

IN GRADES A, C AND D

Contingent upon state of supply, Seymour Phosphor Bronze Welding Rods may be had, under war regulation, through your welding supplies dealer.

SEYMOUR Phosphor Bronze WELDING RODS

The Seymour Mfg. Co., 11 Franklin St., Seymour, Conn.

NON-FERROUS ALLOYS Since 1878

Goggle Safety Booklet

"Safe Practices Pamphlet No. 14" is a 12-page, letterhead-size treatise on the subject of safety goggles. Among the topics covered are: when to wear goggles, operations and processes requiring eye protection, styles of goggles and the classification of hazards—impact, dust, splashes, fumes or gases, glare and injurious light rays. Other paragraphs are devoted to the six factors to be considered when selecting the type of goggles to be worn on a specific job; namely, frames; lens containers; connector between lens containers; side shields; temples, headbands, etc.; lenses, windows and cover glasses. Goggle fitting, anti-fogging, inspection, cleaning and sterilizing are also covered.

A slight charge will be made for this booklet if the person requesting it is not employed by a company member of the **National Safety Council,** 20 North Wacker Drive, Chicago 6.

» «

Stulz-Sickles Catalog

A 4 by 9 in. folder describes the "Manganal" line of welding products, which include a-c and d-c electrodes of 11 to 13½% manganese alloy steel, flat, round and square applicator bars, forged wedges and cast manganese steel wedge bars. The "Seaco" line of hard-facing electrodes is also covered. **Stulz-Sickles Co.,** 134-142 Lafayette St., Newark, N. J.

» «

V-Belt Drives

Allis-Chalmers Bulletin B6249 offers simplified engineering data for the use of fractional horsepower V-belts and sheaves. Also included in this 44-page, letterhead-size book are working formulas from which correctly-engineered fractional horsepower drives can be derived. **Allis-Chalmers Mfg. Co.,** Milwaukee 1.

» «

Hoist Instruction Manual

A four-page letterhead size instruction bulletin, No. J-711, has been prepared to give necessary information on the installation, operation, general care and maintenance of "Zip-Lift" electric hoists. **Hoist Division, Harnischfeger Corp.,** Milwaukee 14.

» «

Burdett Catalog

A 48-page, letterhead-size catalog of welding and cutting equipment and supplies has been issued by **The Burdett Oxygen Co.,** 3300 Lakeside Ave., Cleveland 14. The products covered include oxygen, acetylene, pyrolene, hydrogen, nitrogen and carbon dioxide gases, gas-welding and arc-welding equipment and gloves, goggles, welding lenses, helmets, safety clothing and other welding accessories.

» «

Anniversary Catalog

In commemoration of its 30th anniversary, **Claud S. Gordon Co.,** 3000 South Wallace St., Chicago 16, has issued an anniversary catalog dealing with Gordon-built metallurgical equipment. Several pages are devoted to the company's X-ray inspection laboratory, which serves the Chicago area.

» «

Heat-Treating Baths

The use of neutral baths for heat-treating purposes is explained in a new 32-page letterhead-size booklet. A neutral bath is defined as a compound of properly selected chemicals designed to provide a molten heating medium that neither carburizes nor decarburizes the work. Such a medium surrounds the parts treated and acts as a seal against the atmosphere. **The A. F. Holden Co.,** New Haven 8, Conn.

» «

Goggle Cleaning Leaflet

Bulletin No. CE-24 is a single-page, letterhead-size leaflet describing a goggle cleaning cabinet that makes it relatively easy for workers to keep their goggles clean. **Mine Safety Appliances Co.,** Braddock, Thomas and Meade Sts., Pittsburgh 8.

Ask for CMD WELDERS' CHIPPING HAMMERS

A type for every weld cleaning need. Cutting edges stay sharp a long time. Write Department 4W for descriptive circular now!

TYPE CB
Triple Duty
Combines 3 tools in 1—drift, chisel, and removable wire brush.

TYPE A
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Made from high-grade tool steel. Especially popular in malleable iron and grey iron foundries for general chipping.

TYPE C
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Same as Type CB but without brush.

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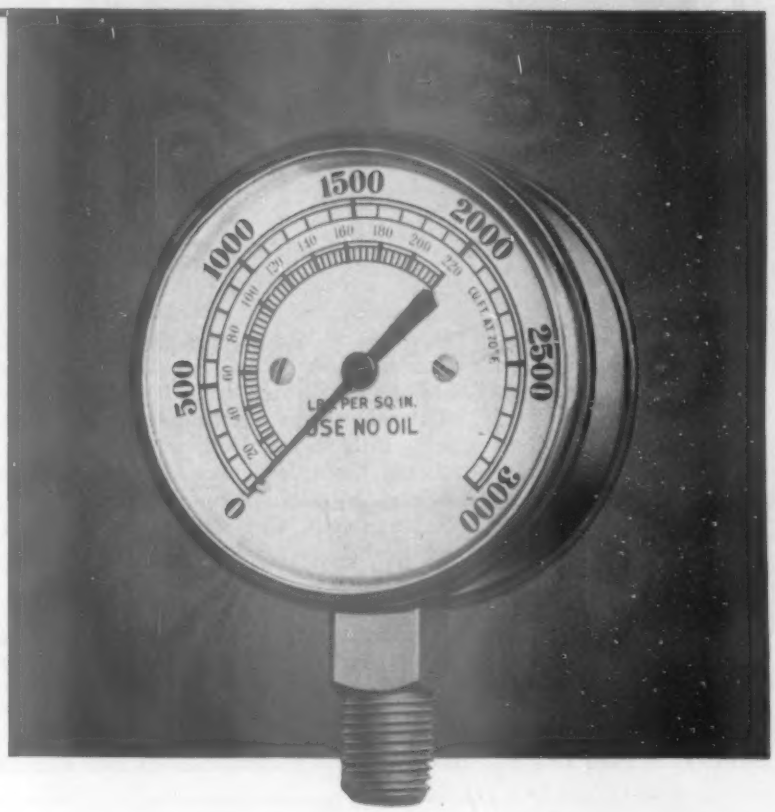
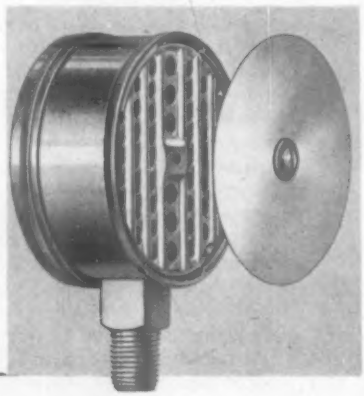
CORRECT PRESSURES FOR OXY-ACETYLENE OPERATIONS

MOTO METER PRESSURE GAUGES



Operators who cut, treat or join metals by oxy-acetylene flame processes have the assurance and protection of proper pressures when their equipment includes MOTO METER Pressure Gauges.

These gauges save man hours, serve to hasten essential production and conserve vital gases through precise pressure indication. Designed and manufactured by MOTO METER, pioneers in the development of dial-type precision instruments. MOTO METER Pressure Gauges are standard equipment for oxy-acetylene apparatus, and listed as approved by Underwriters Laboratories.

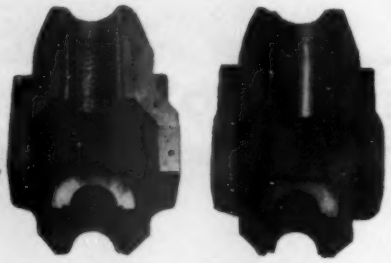


Rear view of pressure gauge shows grid-retainer plate—exclusive with MOTO METER gauges. This is a special safety feature which gives added protection to operator and plant equipment.

THE ELECTRIC AUTO-LITE COMPANY
MOTO METER GAUGE & EQUIPMENT DIVISION
CHRYSLER BUILDING, NEW YORK 17, N. Y.

Yes

Our customers make machinable Arc Welds on CAST IRON



Before machining — After machining

After being welded with PHILLIPS "600" Electrode this cast iron housing was machined through the fusion zone.

This book tells what procedure is best for your cast iron welding.

Send for your copy TODAY

PHILLIPS "600" Electrode, a non-ferrous, flux-coated rod, produces deposits that are of the color of cast iron and are *fully machinable through the line of fusion.* It can be used in all positions with A.C. or D.C. and maintains a steady and quiet arc without excessive spatter. This electrode is salvaging many valuable castings daily in hundreds of foundries and machine shops. Complete procedure information is contained in our 12-page book on "4 Ways to Salvage, Reclaim and Conserve Iron Castings by Electric Arc Welding." A copy is yours for the asking.

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MANUFACTURERS AND DISTRIBUTORS OF WELDING ELECTRODES AND SPECIALTIES

"EITHEREND" CABLE CONNECTOR

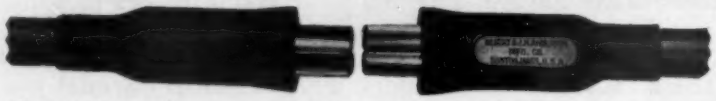

Illustration shows connector apart with sleeves

BOTH ENDS EXACTLY ALIKE

Neither male nor female

Center illustration shows connector protected by the insulating sleeves pushed together and locked, ready for work: butt rubber sleeves make waterproof joint.

Lower illustration shows solderless type of connector without rubber sleeves. Made in sizes from 4/0 to #10 soldered and from 4/0 to #6 solderless.

Send for Bulletin 49A

Albert & J. M. Anderson Mfg. Co.

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NEW YORK CHICAGO PHILADELPHIA LONDON

Technical Books

Training

ANALYSIS OF MACHINE SHOP OPERATIONS. *By Donald F. Lane. Published by National Foreman's Institute, Inc., Deep River, Conn., 1943. Fabrikoid, 8½ x 11 in., 120 pages. Price $7.50.*

Part 1 of this three-part manual for training apprentices and learners describes how the author prepared a break-down and analysis of all the operations of the machinist's trade. Every effort was made to reduce each machine and process to its fundamental elements so that apprentices and learners would be exposed to a systematic schedule of shop and related instructions.

Part 2, a brief account of how the above analysis may be used, emphasizes the inauguration and administration of apprenticeships and learner programs.

Nineteen sets of data sheets comprise part 3 of the manual. There is one set for each of the common machine tool processes —bench work, heat treating, power saw, drill press, turret lathe, etc. Each set of data sheets provides a brief description of the machine for the particular process, a list of the operations performed, the tools required and an estimate of learning time. Included with each set is a graphic analysis of the human characteristics required in operating that particular machine or performing that process.

» «

Inspection

INDUSTRIAL RADIOLOGY, *Second Edition. By Ancel St. John and Herbert R. Isenburger. Published by John Wiley and Sons, Inc., New York, 1943. Cloth, 6 x 9 in., 298 pages. Price $4.*

Industrial Radiology is a revised edition of the book *Industrial Radiography*, which was published in 1934. The change in name makes it possible to include both radiography and fluoroscopy in the newer volume. The usefulness of radiology to industry, it should be noted, has been steadily increasing ever since the development of high-voltage X-ray generators.

The book presents a difficult subject in a practical, understandable form. It has been written for the student, layman and engineer—for all who desire useful knowledge on the basic principles. No attempt has been made to produce a scientific treatise or comprehensive work on all theories.

The preliminary chapters of *Industrial Radiology* discuss briefly the discovery, history and nature of X-rays, also the details of modern high-voltage X-ray generators. Succeeding chapters describe photographic procedure and the details of radiographing large castings and forgings as well as welded structures. The nature and the use of gamma rays are also covered.

A master index is provided with ample cross references. New material has been added on equipment and accessories, giving the latest developments and improvements in the tools and technique. Probably the most valuable addition is an extensive bibliography, which refers to most articles of industrial radiology that have been published in current literature.

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PNEUMATIC WELD-FLUX SCALING HAMMERS

Especially designed for roughing, peening, removing flux and excess metal resulting from welding operations.

- **made in several sizes**
- **button or lever type throttle**
- **safety chisel retainer**
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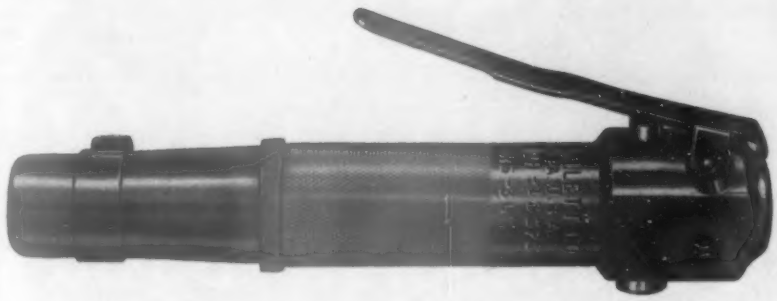

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■ ■ *"DALWELD" DETACHABLE WELDING CABLE CONNECTORS* ■ ■

Save Time While Reloading!

Automatic Welding-head Positioner — adaptable to your own holding fixture.

WRITE
for information relating to your particular welding fixture problem

How TO SPEED UP WELDING OPERATIONS!

Use This Dual Automatic Welding Fixture!

THIS Acme dual fixture arrangement permits practically constant use of an automatic welding head, because one of the fixtures can be reloaded while the other is engaged in the welding operation.

The holding machine can be set to revolve at any angle from vertical to horizontal. (Illustration shows a wheel being welded at 45° angle.) Positioner arm swings from one fixture to the other, locking in proper position. Speed of rotating the work is adjustable, as desired.

ACME *Manufacturing Co.*
1642 HOWARD ST. • DETROIT, MICH.

Specify PERFECTION WELDING ELECTRODES

Use this convenient table to select the correct grade

APPLICATION	A.W.S. CLASSIFICATION	PERFECTION GRADE NO.
Flat and Horizontal Fillets—Reverse-Polarity D.C.	E 6010	P-50X
All Position—Reverse-Polarity D.C.	E 6010	P-50X (V&O)
All Position—Straight-Polarity D.C. or A.C.	E 6012	P-60
Flat and Horizontal Fillets— Straight-Polarity D.C. or A.C.	E 6020	P-61 P-70
Flat Position Only—Straight-Polarity D.C. or A.C.	E 6030	P-80
All Position—A.C. or Straight-Polarity D.C.	E 6013	P-100
All Position—A.C.	E 6011	P-103
All Position—Straight-Polarity D.C.	E 4510	P-170
All Position—Straight-Polarity D.C.	E 4511	P-180
All Position—Reverse-Polarity D.C.	E 7010	Moly-C-Alloy 1
Flat Position—Straight-Polarity D.C. or A.C.	E 7020 & E 7030	Moly-C-Alloy 2

Send for new catalog and Electrode Comparison Chart

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DESIGNED FOR HIGH SPEED PRODUCTION ARC WELDING

TRINDL SUPER INDUSTRIAL ARC WELDERS, the result of many years of careful engineering and "job tested" research, are rolling up impressive production records. Acclaimed for superior performance, ruggedness, dependability, and economical operation.

For better, faster welding, easy-to-operate TRINDL SUPER INDUSTRIAL ARC WELDERS will help step up your production schedules 20% to 40%. Manufactured in a range of distinctive sizes to accommodate every type of shop and production welding job.

Trindl Welders, Electrodes, supplies and accessories, available for immediate delivery, will save you both time and money. Write, wire or phone for full details.

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Do You Agree?

If you, as a reader, do not agree with our answers, let us know your thoughts. Your comments and discussions will be published, too.

Leaded Bronzes

Q—I have been given the job of welding to fill in some surface defects in a bronze statue and have encountered considerable difficulty. Would it be possible for you to tell me what might be wrong?—*J. K.*

A—Statuary bronze is, as a rule, leaded bronze, containing a lead content anywhere from 2 to 15% or more. As is well known, lead gives trouble in welding operations inasmuch as it makes the metal hot short and produces troublesome, unstable oxides. Lead is even more of a handicap in the welding of leaded bronzes than in the welding of leaded brasses because of the higher temperatures which are required in the welding of bronzes.

Statuary bronze may be welded by the oxy-acetylene process if the piece is preheated to about 400 F and the welding puddle is kept small. Plenty of brazing flux must be used to assist in removing the undesirable oxides. Generally speaking (for all the bronzes), either the carbon or metal arc is to be preferred to gas welding. The metal arc calls for a coated electrode in order to make welds that will be thoroughly satisfactory from the standpoints of strength and ductility.

The carbon arc has its limitations. For example in carbon-arc welding, if the arc is too concentrated, too short or the current too high, all of the phosphorous deoxidizer will be evaporated from the weld metal for depths of 3/32 to 1/8 in., leaving the deposit oxidized and unsolid. This situation may be remedied by "spreading" the arc to reduce its intensity on a given area. By drawing the arc out from 1/2 to 1 1/2 in., corresponding to a 35- to 60-volt drop across the arc, less phosphorous is evaporated. Also, the metal is not so much superheated, and less oxidation of the surface and subsurface metal occurs.

» «

Resistance Welding Variables

Q—Are there any other variables than time, pressure and current which will affect a resistance weld?—*J. S. W.*

A—Yes. Time, pressure and current are only three of the ten variables which will affect a resistance weld. These ten resistance welding variables are: (1) time, (2) pressure, (3) current, (4) material being welded, (5) power factor of the welding machine and weld circuit, (6) type and condition of the welding machine, (7) condition of the electrode and the work, (8) length of the horns, (9) distance between the horns and (10) the human element.

Type **BX** (Patented)

Comfortable to wear, it provides adequate protection, ample ventilation. Opaque side protectors. Multiple adjustment. Federal Specification Lens held securely in place in durable retainer. Manufacture in larger volume has resulted in 16⅔% price reduction. Contact your dealer or write us for folder.

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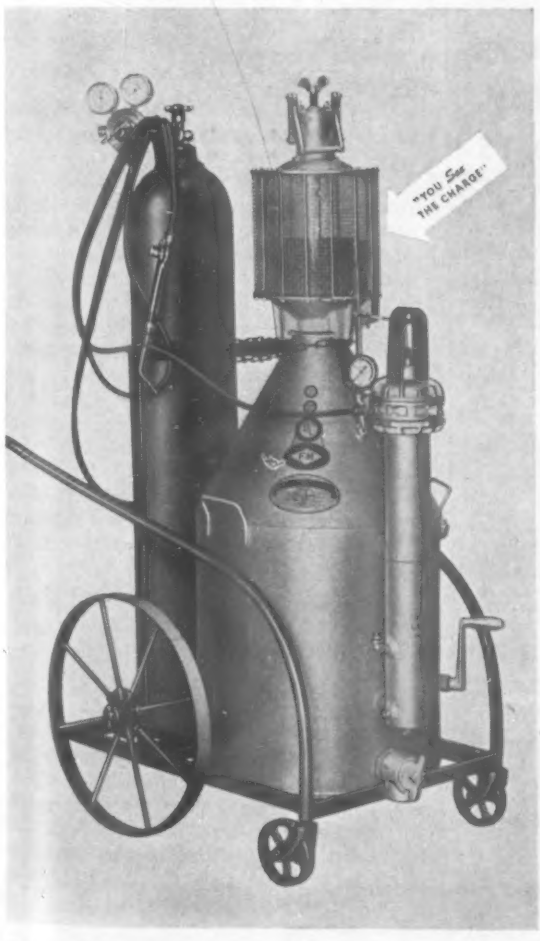

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NICO and get a weld deposit, without preheating, that is **machinable, fine grained,** and the **color of cast iron.**

COPPER ARC and get a weld deposit, without preheating, that is **strong, ductile, nonporous,** and **semi-machinable.**

ARCAST and get a **machinable** weld on castings that can be preheated conveniently.

Order from your nearest jobber or dealer. All leading welding supply houses stock these electrodes.

Manufactured by

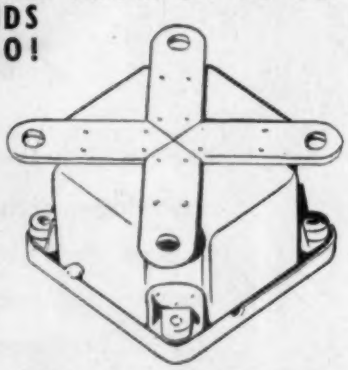
AMERICAN ARC WELDERS, INC.

ROSEAU, MINNESOTA

NOW . . . Spot Weld 2.4 Times Faster like this Cleveland Mfr.

YOU TOO MAY CUT OPERATIONS FROM 34 TO 15 OFF-TIME FROM 29 TO 14 SECONDS AND GET BETTER WELDS TOO!

Spero Electric Co., making 9S Steel Enclosures from low carbon steel stampings to Maritime Commission specifications, found from actual production figures they were taking 2.34 minutes to weld with projection dies on a Universal Model J Spot Welder what normally takes 5.38 minutes to spot weld. Result: Number of operations were reduced more than half; lost time reduced more than half; and total production speeded nearly 2½ times. Investigate today the possibilities for adapting projection techniques to your work. It may profit you and will cost you nothing.



Projection dies required only four contacts to weld the straps (illustrated above) in 16 places. If writing us your problem, use your letterhead, give us a sketch of your weldment, tell us gauge, kind of material, number of welds needed, power line voltage and frequency, if compressed air service is available.

PUT THE STRENGTH WHERE YOU WANT IT!

Illustration shows result of simple tear test you can make on your own vise. Weld was made with projection die on Universal Model J Welder. The base metal failed but the weld nugget held. You may get this type results faster and cheaper than you are now by using projection techniques. Call on us for our help. Tell us the particulars of your job. We will offer our recommendations at no obligation.

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MAIL COUPON TODAY

Universal Power Corp.—4899 Euclid Ave. Cleveland, Ohio
Gentlemen:

Please send new catalog, giving full details and prices on Universal Spot Welders and your full line of equipment and accessories.

NAME.....

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CITY.....STATE.....

Deoxidized Copper

Q—What is deoxidized copper and why is it used extensively in welding?— *N. W.*

A—Deoxidized copper is the name given to copper which has had a small amount of silicon and other deoxidizing materials added during the process of manufacture. The purpose of this procedure is to eliminate oxygen that might result in a coarse weld if the copper were not deoxidized.

» «

Extrusion Process

Q—What is meant by extruded aluminum?—*G. Q.*

A—Extruded aluminum is the name applied to aluminum shapes which have been formed by extrusion. This process can also be applied to other metals than aluminum. The metal to be extruded is placed in a closed chamber fitted with an opening at one end and a piston at the other. Hydraulic pressure then forces the metal through the opening (which is really a die) and so into the desired shape. Extrusion has an advantage over rolling in that it can produce perfectly round rods as well as rods of an intricate shape.

It should be understood that extrusion is entirely a matter of solid flow and not of a plastic mass like molten solder. Aluminum alloys are extruded at temperatures of from 700 to 950 F. Lead can be satisfactorily extruded as pipe or cable sheath at 400 F, while brasses must be heated to about 1,500 F. In general, the lower the melting point of the metal the easier it will extrude at a given temperature.

» «

Acetylene Generator Heat

Q—Can it be explained why an acetylene generator occasionally becomes so hot the water in it boils?—*G. S.*

A—There are two reasons why an acetylene generator may become heated in operation. One reason for this difficulty is that there is an insufficient amount of water in the generator. Since there will not be adequate cooling, the generator naturally overheats. The second cause is due to the failure of the operator to add clean water when the generator is recharged. Instead of draining the generator tank and adding fresh water with the new carbide, he merely adds carbide. In this event, the water becomes "loaded" with carbide sludge, which will reduce its cooling ability. This often results in overheating even when the amount of water present is normally sufficient for cooling.

» «

Flame-Shrinking

Q—What is flame-shrinking?—*L. C. M.*

A—Flame-shrinking is a process of heating and quenching buckled or warped plates. Heating is done with the oxy-acetylene flame and quenching immediately afterwards, using either water or a compressed air and water mixture. This sequence accomplishes an upsetting action on the metal, resulting in a shrinking with a consequent straightening of the plate.

Larkin
Spot Welders

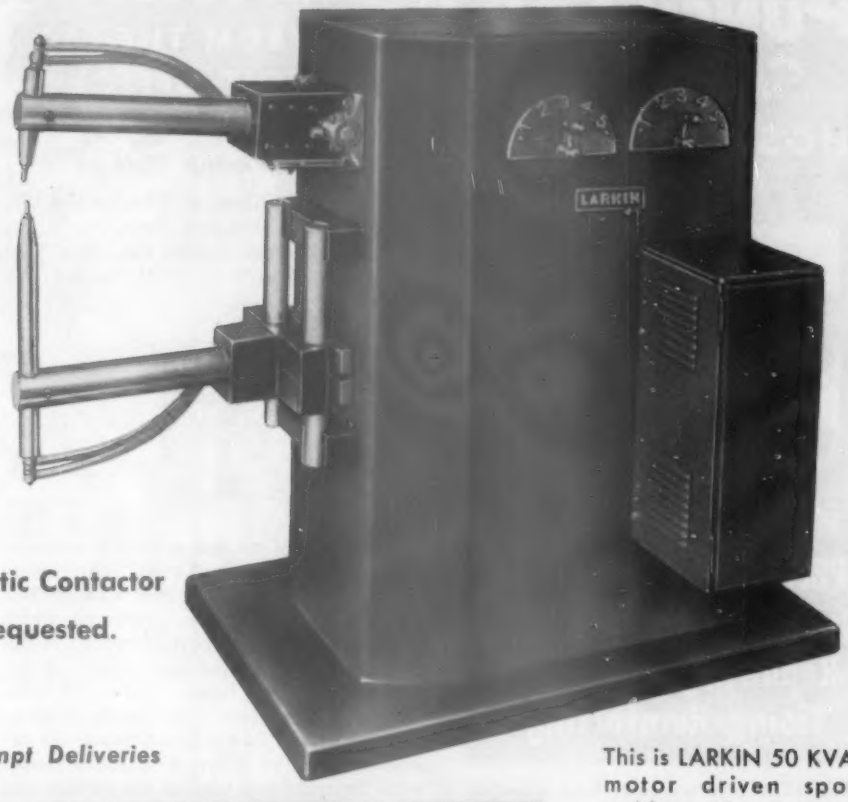
are seeking distribution through active jobbers.

Complete line of Foot-Operated and Press Types, Motor-Driven and Air-Operated Spot Welders.

Also equipped with Magnetic Contactor and Precision Timers when requested.

HIGH Power Factor.

Attractive Discounts *Prompt Deliveries*



This is LARKIN 50 KVA motor driven spot welder with contactor and timer.

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Flexible for any welding position . . .
protection against the flames and sparks of welding.

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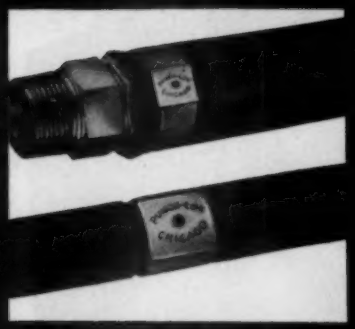
Streamlined
HOSE BANDING METHOD



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PUNCH-LOK Streamlined Hose Banding Method is being used in hundreds of production and maintenance jobs in all industries for connecting high-pressure hose; splicing electric cable; stopping leaks in steam and water lines; reinforcing and mending splits in crossarms and ladder rails; tieing rigid conduit or flexible cable to existing pipe lines or girders; tieing ends of wire or manila rope to prevent fraying—and many other jobs. PUNCH-LOK is giving wartime industries a fast, safe, economical, quality banding method. Investigate NOW the many advantages it will have for you in your present and postwar work. Let PUNCH-LOK solve your clamping or banding problems!

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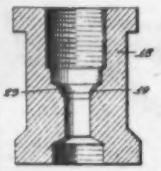
FROM THE PATENT OFFICE

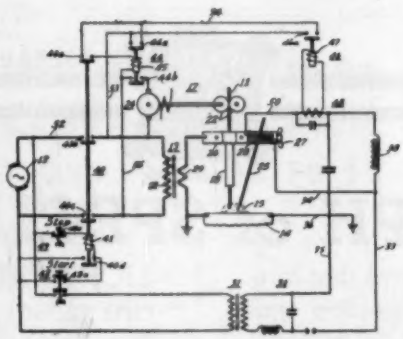
Hard-Facing Method

2,341,006. **William A. Wissler** and **Wilber B. Miller,** Niagara Falls, N. Y., assigned to **Haynes Stellite Co.,** New York City. Filed March 17, 1939. Issued Feb. 8, 1944.



A method of making a shaped, smooth-surfaced lining of hard cobalt-chromium-tungsten alloy on an inner wall surface of a hollow steel body, access to which is confined to a narrow passage. A retaining wall is spaced inwardly from the inner surface to hold a flux and solid pieces of the alloy. The body is then furnace heated in a non-oxidizing atmosphere until the alloy melts and bonds with the unmelted steel of the surface and of the retaining wall. The latter is removed by machining as a final step in the process.

» «



Submerged Melt Welding

2,340,093. **Alfred B. White,** Murrysville, Pa., assigned to **Westinghouse Electric and Mfg. Co.,** East Pittsburgh, Pa. Filed Dec. 3, 1942. Issued Jan. 25, 1944.

A system for welding through a blanket of flux material which is normally non-conductive but becomes conductive when molten. The welding circuit includes a main electrode for welding and an auxiliary electrode that is positioned adjacent to and insulated from the main electrode. A high frequency generator is connected to the auxiliary electrode and the work-piece in order to initiate an arc through the flux. By melting a portion of the flux, the high frequency arc provides a conductive path for the current from the main electrode. The welding electrode is fed into the molten flux while the auxiliary electrode melts the flux ahead; thus the welding arc will be constant and continuous.

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Self-closing caps on all nozzles.
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As shown, or with saddle bridge and reinforcing bridge bar.

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Fluxine No. 43 is the safest flux for silver soldering stainless steels, ordinary steel or any metal where low melting silver solders are specified. It's different because it gives off no injurious fumes. Very economical due to high concentration. Before using, it must be thinned with water to make a creamy paste. Causes the solder to flow over every interstice at the point of union, resulting in strong, solid joints. The solution can be kept hot over a sand bath. This will permit the flux paste to adhere more readily to dirty, greasy surfaces.

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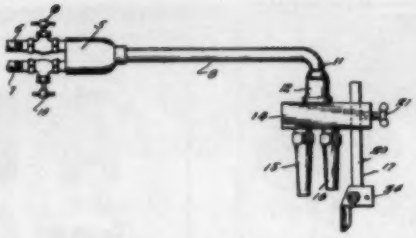
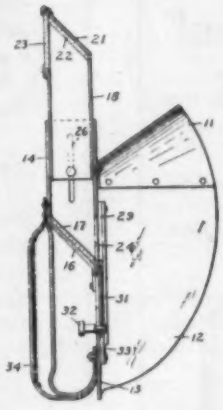


Aluminum Cutting Torch

2,341,358. **George F. Brow** and **Frank Rioux,** East Braintree, Mass. Filed Feb. 10, 1943. Issued Feb. 8, 1944.

A cutting torch having a supply tube for inflammable gas, a head and a cutter unit. The latter includes a cutting edge and a burner tip which projects from the head and is adjacent to the cutter unit.



Mask-Periscope Combination

2,341,391. **Emanuel F. Shipman,** Philadelphia. Filed Dec. 26, 1940. Issued Feb. 8, 1944.

The combination of a welding mask with a vision opening in its front wall and periscope with lower end covering the vision opening and extending above the mask. The periscope, which is secured to the mask's front wall, is a telescopic tubular member with a transparent portion at the end farthest from the vision opening and a pair of fixed, substantially parallel mirrors. Light rays passing through the transparent portion in a given direction are reflected in a parallel direction through the vision opening.

» «

Method for Making Radiographs

2,340,923. **Cormack E. Boucher,** Seattle, Wash. Filed Dec. 1, 1942. Issued Feb. 8, 1944.

In this method of radiographing, a pair of films are arranged in a slightly overlapping relation adjacent to the surface of the object to be radiographed. A reference character of a material relatively opaque to the penetrative rays is placed between the object and the overlapping portions of the films, while a backing substantially opaque to the rays is arranged over the upper surface of the films but not extending between the overlapped portions. The rays are then passed through the object, exposing the films.

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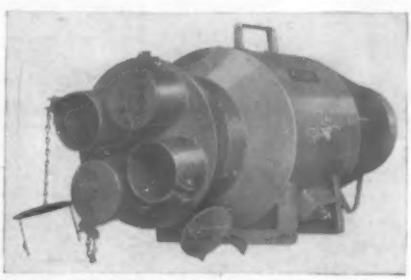

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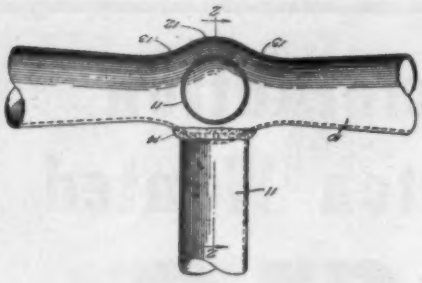
Resistance Welding Control

2,340,076. **Robert W. Pearson,** Wilkinsburg, and **Slavo J. Murcek,** Duquesne, Pa., assigned to **Westinghouse Electric and Mfg. Co.,** East Pittsburgh. Filed Sept. 27, 1941. Issued Jan. 25, 1944.

An electronic discharge valve controls the current flow from the power source to the welding load; this electronic valve is controlled in accordance with the potential of a capacitor that is constantly tending to charge at a preselected rate. The capacitor is discharged in a predetermined interval of time after the potential has risen to a preselected magnitude.



Welded Pipe Connection

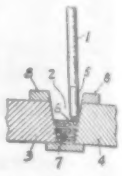
2,340,309. **Clarence L. Dewey,** Elkhart, Ind. Filed July 6, 1942. Issued Feb. 1, 1944.

A welded connection in which a first element having a spherical-walled bulge is welded to a second element that is cylindrically tubular. The latter is cross cut on a flat plane to obtain a butt end face having a circular wall that will contact, along its inner rim only, around the curved wall of the bulge. A welding ring surrounds and underlies the butt face, uniting the elements together.

» «

Arc-Welding Method

2,340,796. **John J. Chyle,** Wauwatosa, Wisc., assigned to **A. O. Smith Corp.,** Milwaukee, Wisc. Filed Oct. 5, 1942. Issued Feb. 1, 1944.

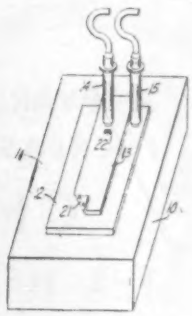


A method of improving the uniformity of side wall fusion in the metal-arc deposition of weld metal in a relatively deep groove. A coated welding electrode is rapidly oscillated from side to side as the electrode is advanced along the groove. Engagement between the electrode coating and the side wall of the groove is effected at each extremity of movement of the electrode.

» «

Back-up Plate

2,340,680. **George J. Oswald** and David **I. Cronin,** Dayton, O., assigned to **The National Cash Register Co.,** Dayton. Filed Feb. 25, 1941. Issued Feb. 1, 1944.



A support for work to be welded, consisting of a piece of rigid backing material having a surface coating that conducts heat but is electrically non-conductive. The backing surface conforms in contour to the work surface placed in contact with it and prevents the work surface from being marred when a weld is made.

» «

Welding Rod

2,338,812. **Stanley R. Hood,** Birmingham, Mich., assigned to **W. M. Chace Co.,** Detroit. Filed Dec. 4, 1941. Issued Jan. 11, 1944.

A welding rod composed of an alloy of molybdenum, tungsten and iron. In this composition, the tungsten is not more than 8% nor the molybdenum more than 5%, but the sum of the amounts of molybdenum and tungsten is at least 2% of the alloy.

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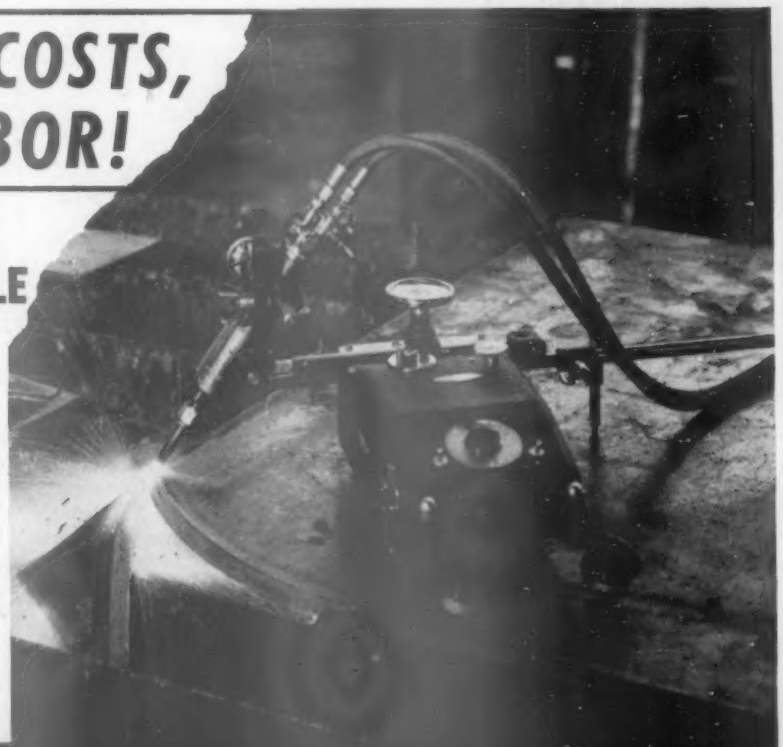

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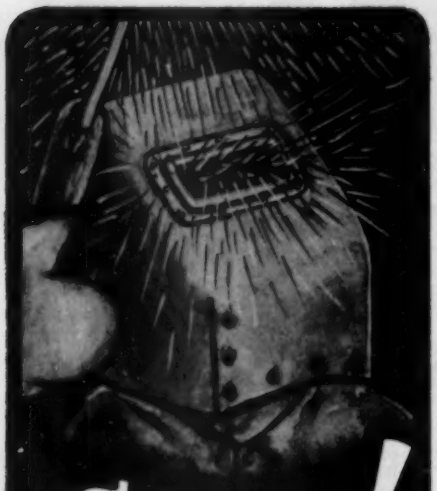
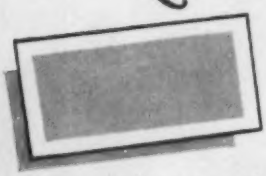


Stop!
WASTING
MAN HOURS
with
SPATTERED
Welding
Lenses



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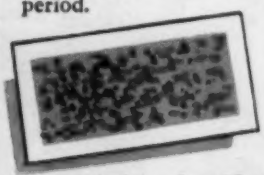

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Metal-Spray Gun

2,340,903. **Arthur P. Shepard,** Forest Hills, N. Y., asigned to **Metallizing Engineering Co., Inc.,** Long Island City, N. Y. Filed July 31, 1940. Issued Feb. 8, 1944.

An improvement in the construction of a nozzle for a metal-spray gun having a burner tip provided with a wire-feeding orifice surrounded by multiple burner jets. The improvement consists of an air cap with a first inner surface portion immediately surrounding the burner tip and defining with it at least one gas blast passage. A second inner surface portion extends the gas blast passage in advance of the orifice and serves to direct the gas against the molten tip of the wire feeding through the orifice.

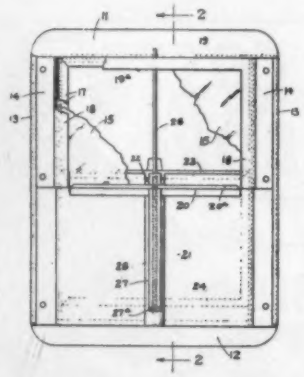
» «

Resistance Welding Control

2,340,131. **Harold W. Lord,** Schenectady, N. Y., assigned to **General Electric Co.,** Schenectady. Filed March 1, 1933; renewed Dec. 21, 1937. Issued Jan. 25, 1944.

An electronic circuit with an a-c source, a transformer which does not have a substantial core saturation when connected for substantially full periods of the voltage, and an electronic tube means for connecting the transformer to the source. The tube is rendered conductive only during the full periods of the voltage.

» «



Weldor's Helmet

2,337,389. **Edward S. Hebeler,** Williamsville, N. Y., assigned one-half to **Unit Rays, Inc.,** Cleveland. Filed July 16, 1941. Issued Dec. 21, 1943.

A weldor's mask or helmet having a vision opening in the front, guides located adjacent to each side of opening and extending below it, and a glare-proof shield reciprocably mounted in the guides. Shield comprises an eye-protecting plane that is adapted to be moved upwardly into registration with the opening and downwardly out of registration with it. A spring tends to force the shield upwards so that it has to be held in its downwards position by means of a releasable latch. A pivotally supported operating member connects with the latch and is yieldably engaged with it to hold the shield in place when the latter is in its lowered position.

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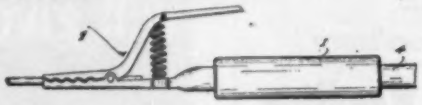
Electrode Holder

2,336,732. **Frank W. Howard,** Portland, Ore. Filed Dec. 9, 1941. Issued Dec. 14, 1943.

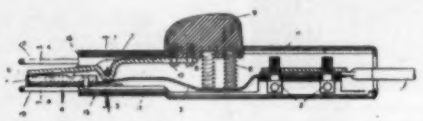


An elongated cylindrical handle of insulating material is provided with two longitudinal bores, one being of greater diameter than the other so that an annular shoulder is formed between them. A double-ended metal cap having outside diameters corresponding with those of the bores is bored at its opposite ends to receive a cable and the electrode holder. Intermediate the bores is a solid integral wall having a tapered aperture through which fits a tapered pin. Extending also through the apertures in the handle, this pin urges and maintains the shoulder of the double-ended cap against the annular shoulder within the handle.

» «

Electrode Holder

2,338,000. **George G. Landis,** University Heights, O., assigned to **The Lincoln Electric Co.,** Cleveland. Filed Aug. 20, 1942. Issued Dec. 28, 1943.



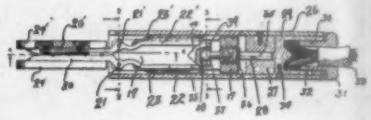
An electrode holder comprising a welding-lead connecting means, electrode-gripping jaws and an insulated handle enclosing the assembly. The jaws project beyond one end of the handle, and insulated wirelike members extend from the handle to form an open protective cage about the jaws.

» «

Electrode Holder

2,336,712. **Philip Bourque,** Detroit, assigned to **Borden Mfg. Co., Inc.,** Detroit. Filed Oct. 27, 1941. Issued Dec. 14, 1943.

An electrode holder with a handle comprising a pair of sections adapted for arrangement in alignment with each other. An electrode-gripping mechanism is carried by one of these sections, while

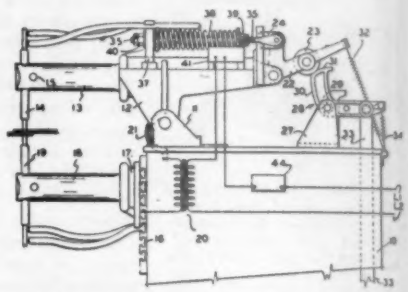


an actuating mechanism for the gripping mechanism is carried by and entirely enclosed within the other section.

» «

Spot Welder

2,337,302. **Melvin M. A. Seeloff,** Warren, O., assigned to **The Taylor-Winfield Corp.,** Warren, O. Filed April 29, 1942. Issued Dec. 21, 1943.



Welding apparatus comprising in combination a normally fixed and a movable electrode, the latter being adjustably mounted on a member for movement toward and away from the fixed electrode. Upon the closure of the electrodes onto the work, a member (called "second member" in order to distinguish it from the member upon which the movable electrode is mounted) will move relatively to the first member upon the application of a predetermined force. Means for moving the second member comprise an element adapted to move a predetermined distance during each welding operation; this element is so linked to the second member that upon initiation of movement and during movement of the element through but a portion of its path a quick closing of electrodes onto the work is effected. A substantial portion of the movement of element is utilized to effect a yielding of a yielding member.

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